# THE COMPUTER BULLETIN

## VOLUME TWO

## JUNE 1958 – MAY 1959

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# GROUP STUDY

One of the fundamental objects of the Society is to encourage individual members to meet to discuss their problems in the computer field, to exchange their experience and opinions, and to engage in friendly argument. The first (1957–58) session of the Society's London Study Groups has now ended, conclusions reached, reports written. Much of this organisation, and many of the groups themselves, has descended from the work of the London Computer Group, whose reports were published in *The Computer Bulletin*, No. 3, for the 1956–57 session. This issue contains précis of the reports for 1957–58, and 1958–59 activities, both in London and in many Regional Branches, are now being planned.

The vacation between sessions provides the opportunity to look back over the work of the groups. Do these groups serve a useful purpose? Are their findings of value? Why are they, almost exclusively, concerned with business rather than scientific applications?

These and many other questions are exercising the minds of those concerned with Study Group organisation. To many such questions there can be no precise answer until the scheme has run for a longer time than one or two sessions; but there remains the outstanding fact that some 400 members have been active in the London area groups in the past session, that many of them would otherwise have had no opportunity of meeting others with similar interests and problems, and that their reports must be taken as representing a body of opinion that cannot be ignored.

It is particularly in the business field that there is this need for Study Groups; mathematicians and scientists have their established channels for intercommunication through professional societies, universities or technical publications, and their development of the machines and techniques was some years in advance of business interest. The "commercial" user is more often a member of a professional organisation which tends to look on computers as machines of the future, of uncertain value, to be regarded with suspicion and accepted with hesitancy. If Study Groups do no more than help business users to overcome these doubts and suspicions, they will have served a valuable purpose; if they spread knowledge of data-handling techniques and thus increase the number of successful installations, they will have contributed in a very real sense to efficiency in British business methods and management.

But we must emphasise that Study Groups can be formed wherever, and for whatever, purpose they may be needed, mathematical, scientific, engineering or "commercial." They are not, however, intended for the complete novice, to replace preliminary training or application courses which are essentially the function of Technical Colleges and other bodies. Each member of a group should have something to contribute; participation brings a two-way benefit—to the group as a body, and to the member as an individual.

This is an important side of the Society's activities; it is one that cannot function without the active interest of members; it cannot be organised without the work of Study Group Chairmen and Secretaries. To them, and to the Study Group Sub-committees of the Business Group and of the Regional Branches, the Society is deeply grateful. From their experience the programme for next session, and the operating arrangements, are being devised; we wish them well, and we urge every member to give them full and continuing support.

# MEMBERS' DIARY

## *JUNE 1958*

4 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 2.30 p.m.—"Some Aspects of the Logical Design of Very Fast Computers" (C. Strachey, National Research Development Corporation).

12 BRADFORD (Leeds and District Branch)—"Operational Research" (Dr. Tocher and Dr. Owen, United Steel Company Limited)

16 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 5.30 p.m.—Annual General Meeting of The British Computer Society Limited (Refreshments will be available after this meeting)

6.30 p.m.—The Presidential Address (Dr. M. V. Wilkes, F.R.S., Director of the Mathematical Laboratory, Cambridge University)—"The Second Decade of Computer Development."

25 GLASGOW—"Data v. Information for Business" (Professor R. H. Gregory, Massachusetts Institute of Technology).

## *JULY 1958*

9 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 5.30 p.m.—"The Cost and Value of Business Information" (Professor R. H. Gregory, Massachusetts Institute of Technology).

15 LEEDS—"Office Automation in Practice" (G. A. Randell, Leo Computers Limited).

## *AUGUST 1958*

1 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 2.30 p.m. Symposium on Automatic Programming, opening with "The Theory and Practices of Automatic Programming in the U.S.A." (Professor John W. Carr III, University of Michigan, and Retiring President of the Association for Computing Machinery).

# COMPUTER COMMENT

## *French Insurance Group Shows the Way*

For the last four months an IBM 705 Computer has been in use with the "Compagnie Generale D'Assurance" in France.

The CGA group, often referred to as "le groupe Drouot", is made up of five insurance companies whose combined monthly billing reaches 180,000 premiums, and is the largest privately owned insurance concern in France. During the last ten years monthly premium billing has been multiplied by five, and the number of contracts doubled. Business has been increasing by 15 to 20% annually in recent years, but the state of the French labour market ruled out the possibility of increasing staff in the same proportion.

The CGA group decided that the answer lay with a computer. The rightness of this decision is confirmed by the fact that despite the increase in business, and despite the fact that staff has decreased considerably in this period, work is carried out more quickly and more comprehensively than ever before. The time taken for the billing of 180,000 premiums has been reduced from 6 or 7 weeks to 9 days. Monthly accounts of 3,000 agents can be prepared in 15 hours instead of taking a whole week.

Daily movements are fed to the 705 on punched cards. More permanent records are kept on magnetic tape, each reel holding 5,760,000 characters: 100 reels of this tape, occupying about a cubic yard of space, hold the records that were formerly contained on punched cards occupying about 100 cubic yards.

M. Tattevin, the managing director of the CGA group, has said that no clerical staff will be dismissed through the installation of this computer, for the group's activity allows for the rapid re-deployment of staff. Much new work, which was impossible by manual methods, has been created. A new emphasis has been placed on the use of the statistics which the computer compiles. A new class of specialist employee has appeared: the programmer.

## *Mathematical Language in the Computer Era*

Automatic coding schemes such as those described by R. A. Brooker in the first issue of *The Computer Journal* enable the user to write his programs in a language which is easier to use than the primitive instruction code of the machine itself. The conventional language of mathematics is, because of its common acceptance, an attractive one to adopt for programming purposes. It has certain disadvantages, however. It uses a very wide range of symbols of various sizes, not easily handled by an automatic printer, and it needs extending in various ways for computer use to take account of the different forms of number representation, to indicate the sequence of execution of operations, and to call for printing, etc.

Programmers have occasionally speculated on the possibility of establishing a new conventional mathematical notation, suitable for use in programming computers. Hitherto such suggestions have been premature, since the techniques of automatic coding were still being developed. Now, however, the President of the Association for Computing Machinery, Dr. John W. Carr III, has appointed an *ad hoc* committee "to attack the problems involved with standards and specifications of algebraic language". If successful, the Association may seek international agreement on the subject.

# CORRESPONDENCE

*Letters from readers are welcomed, and should be addressed to The Editors, The Computer Bulletin, Finsbury Court, Finsbury Pavement, London, E.C.2. The name and address of the writer must be given, but will not be published if requested.*

## *Yes + No = ?*

Sir,

I was amused to notice in Vol. 1 No. 5 of the *Bulletin* the comment on page 160 under the heading "Yes + No = ?"

We are all aware of the desire of our American friends to be the leaders in most fields of scientific endeavour but, in this case, they have excelled themselves. The story which you relate concerning the Versailles Peace Treaty was first told by me at a lecture to Convocation at London University on 18 October 1957. It was designed to show the application of computers to legal studies and to amuse the audience. I may perhaps add that it is entirely apocryphal!

Yours etc.,

*Birkbeck College, W.C.1.* Andrew D. Booth
*21 April 1958*

(*Editors' Note:* The original item was reported in two American papers, without revealing the source, and quoted in this country by a news agency and by the New York correspondent of a national newspaper. We apologise to Dr. Booth for not following the trail to the end, and at the same time congratulate him on enriching computer folk-lore!)

## *British Transport Commission*

Sir,

We would be glad if you would publish in the next issue of *The Computer Bulletin* a correction to the erroneous statement which appears in Issue No. 5 for February/March 1958 on p. 166, namely, that the British Transport Commission has only one computer operating.

The position is that BTC has in fact three computers now operating: a PCC at Swindon and HEC 4 machines at Paddington and Bristol. All are on paybills with capacity for extension to other office applications. Installations for similar work are in progress at Derby (four HOLLERITH 555's) and at Darlington (a HEC 4 and a HOLLERITH 555).

The rest of the statement is true. We have several other computers on order and have already investigated, or are still in the process of investigating, many of the problems peculiar to the transport industry.

Yours, etc.,

*222 Marylebone Road, N.W.1.* D. P. Kilner
*7 May 1958* *Technical Assistant, Electronics Advisory Officer*

# LONDON STUDY GROUP REPORTS 1957–1958

This survey of the work done by London Study Groups last session is published for the convenience of Members as a means of ready reference to the more detailed reports. These, running to some 300 pages, are filed in the Society's office; members wishing to consult them should apply to the Assistant Secretary. Additional copies are being sent to Branch Honorary Secretaries for consultation by Branch members. The reports are not available to the general public.

The very considerable effort of Study Group Chairmen and Honorary Secretaries during the past session is gratefully acknowledged, as also is the work of members of the Study Group Sub-committee in summarising the reports.

*The opinions expressed and conclusions reached are those of the individual groups, and are not necessarily those of the Society or of the Honorary Editors of* The Computer Bulletin.

The summaries which follow cover all reports received up to the time of going to press; any others received subsequently will be published in a later issue.

## ADMINISTRATIVE AND FINANCIAL PROBLEMS AFFECTING COMPUTER INSTALLATIONS

*This subject was considered by four groups: 6a, 6b, 6c and 6d.*

### *Appraising the Problems*

Group 6*a* is of the opinion that owing to the differences in detail arising from the varying size and nature of different organisations, a comprehensive list of problems, framed in the form of questions, which must in all cases be answered, will probably be more useful than attempting to deal with a few specific problems in detail, especially as the solutions to these would almost certainly be peculiar to each organisation.

A tentative outline of such a blue-print has been formulated, but further thought is necessary regarding the order in which the problems should be tackled.

Recent experience in the United States of America would suggest that to tackle the problem of a computer installation as a mechanisation problem is largely to court disaster by missing the opportunities, as yet largely unexplored in the business field, offered by the potentialities of computers.

* * *

### *Amortisation and Obsolescence*

Group 6*b* defines amortisation as the replacement of the original cost of the computer over the anticipated useful life by annual provisions. Regarding the figure to be amortised,

(*a*) the amortisation of the cost of the computer and its physical installation will follow normal accountancy practice,

(*b*) the cost of feasibility studies should be treated as organisation and methods reviews to be charged to normal current expenditure, as part of a continuous process,

(*c*) the cost of a program library in suitable cases can be added to the cost of the computer, but no general rule can be laid down,

(*d*) the cost of staff training and overheads prior to installation should not be capitalised, and

(*e*) amortisation plans should not take scrap value of the machines into account.

The component parts of computers are easily replaced and, apart from the expendable parts of the equipment, physical wear and tear is not at a high level. It is thought that input and output mechanisms will wear out first and be more liable than the computer to be superseded by improved designs. Annual amortisation should take care of physical deterioration, whereas obsolescence will dispose of writing-off due to the introduction of improved models.

It was ascertained informally that the Inland Revenue, while not yet having committed themselves to a definite opinion, are thinking in terms of an annual allowance of 15% on the written-down value, which together with the initial allowance of 20% would bring down the value to about 20% in eight years. Their view is, however, that the rate of annual write-off is of less consequence than the policy in regard to the renewal of parts and to the free use of the "balancing allowance" on replacement of any main component which has been superseded by an improved design.

The life factor for the purpose of budgeting the cost accounting can well be taken at a lower figure than would be advisable for audited accounts; this may be considerably lower than a figure acceptable to the Inland Revenue.

Subject, therefore, to the general write-off policy of the organisation, prudence requires the adoption for budgetary and cost accounts of a life factor not greater than five years.

There is strong support for the straight line method of depreciation; other considerations may apply to statutory bodies.

It might seem inevitable that so revolutionary an invention must be subject to rapid improvements, which will put purchasers of earlier types at a disadvantage if they do not replace them with improved models. In practice, the degree to which it is necessary to integrate all the accounting procedures with the machine renders it unlikely that, once the organisation is fully tuned to a particular computer, a change will be made to secure those improvements in output or speed of working which is the most one could expect within the anticipated life of the original acquisition. There are many forces operating against changing a machine in any major particular after it has been fully integrated with the business. This accounts for the importance of an exhaustive feasibility study, and for recognition that hasty purchase is not likely to prove profitable. Scientific progress will not lead to any substantial scrapping of equipment during the normal useful life of a computer.

## Rental of Equipment

It is difficult to reach any conclusion on this question owing to the absence of experience. It is thought to be a fallacy to assume that rental enables improvements to be more readily introduced, the factors mentioned in the previous paragraph heavily outweighing the purely financial aspect. So far as taxation allowances are concerned, rental is simpler and more easily understood, but purchase gives a slightly higher advantage in the first year or two, except in cases where the rental is initially high followed by a period at a reduced figure.

In any particular case a decision will probably turn on the attractiveness of the maintenance terms associated with the two methods, and it largely rests with the manufacturers whether they sell or rent.

## Feasibility Study

Whilst the possible advantages from employing outside consultants should not be overlooked, a team drawn from within the organisation, from various departments, should be trained in computer work. Publicity within the organisation and clear terms of reference are essential, with a tight time-table and a report (on the lines of that given in *Computer Bulletin, Volume 1, No. 3, October 1957, page 49*).

* * *

## Management Participation

Group 6*c* considers that the chances of maximum co-operation by management will be improved by

(*a*) the earliest possible introduction to computers, with emphasis on the speedy production of information, powers of discrimination, and ability to store instructions and working data,

(*b*) broad studies of the basic objectives of the concern and the most direct methods of achieving these, assuming that computer equipment is available,

(*c*) stressing the exploratory nature of computer projects and their correspondingly slow progress to maturity, and

(*d*) the careful avoidance of tendencies to claim for computers all that is good.

## Staff Redundancy

This has not yet proved a major problem, and is unlikely to become one, providing that the economic climate during the changeover period enables a generous policy towards less adaptable employees to be maintained.

Original estimates of savings for payroll, invoicing and similar applications are often too high. Failure to appreciate the amount of time and effort needed to set up the associated system is a contributing factor.

There is, in fact, a tendency to maintain or increase staff. A similar tendency has been experienced subsequent to the installation of punched card machines, often due to the demand for information not previously available,

It may well be that industrial concerns who venture to use computers are expansive in outlook and, consequently, able to absorb displaced staff easily.

## Rental and Purchase of Equipment

From the purely financial angle, the total outlay in rental charges during the first three years or so is less than the purchase price plus cost of maintenance. For longer periods, the outright purchase of equipment shows savings which are attractive enough to justify the investment of the substantial capital sum required.

As the steps necessary towards the use of EDP, once taken, cannot easily be retraced, one of the more familiar tactical advantages of renting, as an alternative to buying (i.e. the ability to discard the equipment without appreciable loss and revert to manual or mechanical methods), is diminished. However, subject to the terms of the existing contract, there remains the possibility of hiring more suitable equipment when the occasion demands—providing always that it is available on rental terms.

The effective life of a computer depends on so many factors which have not yet been evaluated that it is prudent to make provisions for depreciation of installations over a fairly short period, say five years. Expenditure on programming, which is a more or less continuous process, should be charged to revenue as it occurs.

## Organisation and Methods Work

Work simplification, which occupies much of the time of O. and M. personnel concerned with conventional systems, is compressed into the period of preparation before the introduction of a computer. Once the new system is established two of the important tasks will be

(*a*) to ensure the efficient use of computer time by periodic review of input schedules and improvements of their procedure pattern and timing, and

(*b*) to check and reset, where necessary, the critical points at which the need for human intervention is signalled.

Experience gained in the use of mechanical punched card equipment is useful. During the changeover period, existing methods, mechanical and manual, and electronic data processing, should be run in tandem. When the change is from manual methods, it is doubtful whether it is necessary to introduce a punched card system as an intermediate step.

* * *

## Introduction to Management

Group 6*d* covered similar ground to Group 6*c*. In addition the Group concludes that it is very necessary to introduce the capabilities and restrictions of computers to management *at all levels* by manufacturers' courses and pamphlets, demonstrations of equipment and internal reports while the research is in progress. Management must appreciate that *ad hoc* information cannot be provided by electronic methods if it means the frequent interruption of other long routines; nor can it give minute to minute information where source data takes time to prepare: hence some parallel manual routines will be continued.

(This group is continuing its meetings and will consider *inter alia* organisation and methods problems; preparing for an installation; amortisation and programming costs; parallel working with old systems.)

# COMPARATIVE DATA ON MACHINES FOR CLERICAL WORK

*Group 7 took up and continued the work carried out by Group 9 in the 1956–7 session which resulted in the publication of comparative data on machines available in the United Kingdom for clerical users* (Computer Bulletin, *Volume 1, No. 3, October 1957, page 88*).

## *Range of Study*

Group 7 concentrated on a comparative study of operational experience. The following machines were among those installed and working in users' establishments on routine clerical application in the United Kingdom before 31 March 1958 and, under the method of approach agreed by the Group, qualified for study:

ELLIOTT 405—Norwich City Council
HEC 4 —British Railways
—Morgan Crucible
IBM 650 —I.C.I. Ltd., Paints Division, Slough
—Rolls Royce, Derby
—Tube Investments

## *Method of Approach*

One installation from each of the above manufacturers was selected as being a most useful typical case. Both user and manufacturer were invited to attend a meeting of the Study Group so that their joint operational experience could be discussed and made the subject of this report.

For each machine, the Study Group appointed a Technical Editor to co-ordinate the views expressed by the members of the Group, a further Technical Editor being appointed to deal with the updating of last year's statistics so that full information should still be available on all machines irrespective of their eligibility for their present study in respect of operational experience. This work continues.

# COMPUTER PROGRAMMING STRATEGY AND TECHNIQUES

*Two groups studied this subject: 8a and 8b. Group 8a will continue and amplify its discussions next session.*

Group 8*b* defines the subject as the study of comparative programming techniques covering the field of operations representing the steps which are taken by the programmers to perform the stages of computation in different jobs, having regard to the functional capabilities of the various computer systems upon which the operations are being carried out.

The following subdivisions were discussed:

(*a*) *Flow Chart Symbols*

Symbols used within any organisation should be uniform throughout. Symbols representing steps common to computers of different manufacturers should be standardised.

It is recommended that the following stages and terms be used:

| | *Recommended Term* |
|---|---|
| STAGE 1—The Plan or series of Plans showing the overall flow of input and output for the particular job in hand | SYSTEMS PLAN |
| STAGE 2—The break-down into more detail of each main program within the Systems Plan | FLOW CHART |
| STAGE 3—The steps to be taken within each Flow Chart. (At this stage simple symbols would be used with written explanations of the steps to be taken) | SEMI-DETAILED FLOW CHART |
| STAGE 4—Showing the logical steps of the program from which it will be encoded. | DETAILED FLOW-CHART |

(Note: Current practice appears to be that the program is encoded before this final flow-chart is completed, because some of the steps are worked out by the programmer when coding)

Where symbols are used the instruction should be written preferably within the symbol.

(*b*) *Programming Strategy and Techniques* (*including economical use of storage space*)

(i) As the internal storage of a computer is seldom adequate to meet programming demands, careful planning is required to achieve economical timing and to minimise the amount of input data; ancillary equipment (e.g. punched cards) can be used for the latter purpose in pre-editing, sorting and summarisation.

(ii) On magnetic tape machines, the relationship of rewinding and spool changing times against productive running time must be considered.

(iii) Data fed to magnetic tape should be stored in binary code, except where printing out is required.

(iv) Variable length records on magnetic tape may save tape at the expense of extended programming; fixed length working is probably faster.

(v) Scope exists for such devices as the use of sub-routines, repetitive sequences, codes, etc., and also in-built circuitry for conversions, assembly, etc.; such circuitry should have maximum flexibility, minimum of delay on conversion, and must be under the control of the programmer.

(vi) Incorporation of program checks depends on pre-input checking of data, and on automatic checking facilities within the computer.

(vii) Checks considered essential, whether by program or in-built circuitry, are:

(1) to control processing and transfer of information at suitable points,

(2) frequent checks on input data, and

(3) frequent checks for plausibility (e.g. payroll—limit of wage amount which it is possible to earn).

Specific checks which are made use of are:

(1) on every character,
(2) on every word,
(3) parity checks,
(4) echo check on tape reading,
(5) on punching, and
(6) on printed output.

(*c*) *Comparison of Methods of Modifying Instructions (and definition and development of automatic programming)*

*These were deferred for discussion until the next Session.*

* * *

Group 8*a* considered flow chart symbols in programming and recommend greater standardisation. The following headings were assembled for further study:

(*a*) Methods of presenting and amending job requirements specification
(*b*) Flow charting methods
(*c*) Layout of program sheets
(*d*) Program testing and development
(*e*) Conversion on input
(*f*) Arrangement of records in the computer
(*g*) Checking
(*h*) Restart procedures
(*i*) Table look-up, key words, etc.
(*j*) Autocoding
(*k*) Sorting into revised sequences
(*l*) Use of computer storage space units

# INPUT/OUTPUT–CURRENT DEVELOPMENTS

*Group 9 limited discussion to output methods. Some of the current equipment available in both serial and parallel printers has been studied and some detail of this equipment is listed in appendices of the report.*

Users should prepare acceptance tests of ancillary equipment prior to installation. These tests would be used as a yardstick by manufacturers in covering the need for reliability. Reliability of equipment must be backed up by a first-class maintenance service to maintain the high standard of accuracy required.

The economics of line and serial printers are also discussed and mention is made of the need of a "Cost Productivity" ratio in relation to speed and cost. In off-line operation, either serial or parallel printers can be economic and used for punched cards, paper tape or magnetic tape; high maximum speed is less essential. In on-line applications, parallel printers are essential, and users must assess carefully the speed required to meet their needs. Serial printers are not satisfactory for this type of application.

# MANAGEMENT IMPLICATIONS

*This subject was studied by two Groups: 11a and 11b.*

Group 11*a* conclude that the effects on management of installing an E.D.P. system may range from a simple speeding up of clerical procedures (and consequently reducing clerical costs) to the redesign of administrative procedures involving changes in the nature and amount of information handled by every manager in a firm. Probably no computer is ever justified solely on the basis of cutting clerical work; there is always at least the hope of other gains, and a survey should be carried out first to examine the areas which are likely to benefit most, bearing in mind the interaction of all the management functions.

Feasibility studies seem to be made along two lines. Firstly, where the structure seems sound, the possibility of using EDP mainly for better information flow arises. It may raise efficiency by supplying information more rapidly, in greater detail, and with better correlation of factors which are often envisaged separately (e.g. stock control, purchasing, and progressing of production); but it may also very rapidly make deductions from data for logical choice of action to be made by management (e.g. the effects of programme changes, of different batch sizes, or of sub-contracting).

As it is clear that, in any management problems involving policies and fundamental decision-making, the EDP installation can only serve as the tool to present the information, by-passing slow paperwork and long calculations, it follows that unsound data fed to it, or omissions, will result in faulty decisions.

The second approach involves analysis of the existing management organisation, with a view to simplifying and improving it in regard to information flow. The information requirements of executive management are examined, and the flow is directed there through a single information centre. The question of *how* the data is to be processed is considered to be unimportant initially, the essential preliminary being to decide *what* data, and *to and from whom* it should be handled. Such an overhaul of the organisational procedures may be lengthy and costly but, it is felt, will be amply justified and may well pay for itself, even if it is finally decided that no computer is necessary.

With either approach the survey must cover most or all of the different sections of a business, in considerable detail, and it is best carried out by a team whose status is well supported by the management: this is essential, and will generally call for the full-time inclusion in the term of several senior staff members, in order that the investigator may both interrogate and influence all levels of management.

With regard to the siting of an EDP installation in a firm with widely scattered activities, it is best for the outlying units to organise their informative data locally (to check it, clear it of errors and omissions) in order to prepare it ready for central processing by the installation.

In general, immediate quantifiable savings (either financially or in respect of labour) by applying EDP cannot normally be expected; improvements will probably be in the nature of better controls, information flow, decision making, utilisation of assets and so on; benefits will be long term but rather intangible.

* * *

Group 11*b* discussed the important question of the *pre-processing* of data before a computer can be installed. While it is possible to use alphabetical or other non-numerical codes for physical description of data, they will have to be translated into some numerical or other digital form, if the data is to be processed within the computer. In some cases the present coding system of an organisation may be suitable or a new system may be easily re-coded from it, especially where there has previously been a punched card installation, but generally management will have to reconsider their whole coding procedure. In a large organisation, an entire change of code numbers will be a major undertaking and may well be too awkward to arrange before computer installation. Some temporary measure may have to be introduced.

The Group also considered the problems associated with *educating management* to the potentialities of computers. These will make possible the introduction of operational research techniques involving large numbers of variables, and the solution of problems and the production of figures at present unobtainable. Instead of the detailed figures available in the past, the computer can print out only the final, necessary results, the mass of figures having been dealt with by the internal operation of the computer. This will lead to the necessity for management to accept reporting by exception. This enlarged conception of business organisation will place the onus on management to say in advance exactly what figures it needs. This vital decision should not be left to the head of the computer department. Management is not yet a science and few members of it can say exactly what figures are needed as a basis for action, nor even what use is made of the figures obtained.

Some further *printed copy of intermediate results* will be needed for record purposes or so that the situation studied can be reconstructed. It is more economic to store records in machine language than in printed form, and it is a selling point for computers that they reduce the volume of printed information with which management have to deal. It is, however, virtually impossible to foresee, at the time the data is stored and the program written, all the questions management may ask.

Operational research techniques are invaluable for studying problems of data flow, both where the input and required output are exactly known and where they are not. Only small linear programming problems can be handled by the computer at present but some practical problems have been solved; many operational research calculations are still being done by hand computation, although the computer would be better where repetitive solutions are required. Sometimes the number of factors in a large problem can be reduced by combination to bring it within the range of the computer. Specifying the problem in symbolic, as opposed to general, terms is skilled work.

The problem of making estimates for the installation of a computer was also discussed.

# TRAINING AND PERSONNEL

*Group 12 considered this subject under the three main heads of EDP appreciation training, familiarisation with business methods, and the use of aptitude tests in selection.*

## *Familiarising Programmers and Operators with Business Systems*

Ideally programmers should be selected from within the organisation and trained in programming by the manufacturers of the equipment installed. It is not necessary for the programmer to have some knowledge of business in general. The best way for a programmer to obtain the knowledge of his own organisation is by actual *on the job* study with the systems analysts. Operators need only be trained to understand in detail the nature of the input and output data of the objectives to be achieved.

## *Appreciation Courses*

(*a*) *Board and Top Management:* It is absolutely essential to get the authority of top management behind feasibility studies, and it should be their responsibility to define the areas for detailed investigations from the recommendations of the feasibility studies team. Top management should therefore have a short appreciation course.

(*b*) *Departmental Heads:* It is vital to have the co-operation of departmental heads throughout feasibility studies, and they should be kept informed by top management of the objects, progress and conclusions. If EDP is to be applied, then user departments directly affected require extensive re-education.

(*c*) *User Departments:* The general effects and implications should be explained by lectures, discussion group meetings, films, house journals, etc., with specific training of staff concerned with data and information (for input and output), supported by memoranda of procedure.

(*d*) *Training of Data Preparation Staff:* It is important to impress on staff the need for accuracy and clarity in preparing original data. This can be assisted by intelligent form design. Where special preparation equipment exists, manufacturers' courses should be used.

## *Aptitude Tests*

Available knowledge and experience to date suggests that there are no established criteria for the successful selection of operators, coders, programmers and systems analysts. It is generally recognised that the qualities necessary to produce a good punched card system operator apply equally to an EDP operator. No aptitude tests are considered to be necessary.

Programming aptitude is difficult to assess, and available aptitude tests do not in themselves provide a short cut to selection. In selecting programmers, it is necessary to distinguish between scientific and mathematical problems and commercial problems. The qualification standard should be set, followed by an aptitude test covering abstract reasoning, verbal ability and a rather involved problem. Manufacturers may be able to assist in this direction.

Much remains to be done to assist industry and commerce in the correct selection of staff on whose shoulders will rest the success of the automation of the work of the office and decision aids to management.

# INTERNAL AUDIT

*This Group (13) will continue in 1958–59 when External and Special Purpose Audits will be covered. The Group had time to cover Internal Audit only during the 1957–58 Session.*

## *Main Problems*

EDP creates new problems for the auditor, both internal and external, on account of the computer's ability

(*a*) to make use of its storage facilities, and
(*b*) to carry out a series of logical operations without normally preparing a record of the interim stages as they take place.

The consequences of (*a*) and (*b*) above are (i) that the auditor, unaided, has no access to the data stored in the system and has, therefore, to rely on material supplied to him by the computer staff, and (ii) that a check by arithmetical means of the system is not always practicable. These consequences involve a search for new safeguards to take the place of some of the audit checks employed for non-computer accounting systems.

The main problem confronting the auditor is the disappearance of the physical trail of a transaction, as permanently evidenced in non-computer accounting systems by journals, ledgers and punched cards. Source data and output data must be arranged, therefore, in such a manner that a check of the computer's operation is feasible.

In an organisation which can effectively employ a computer, clerical processes will, of necessity, be divided into recognised channels and the processes in a computer also operate in a clearly defined manner—a manner which is determined by the program. This enables an auditor, by making sample tests of a series of records, to satisfy himself that the treatment of the bulk will correspond to that of the sample.

Ideally the auditor should be a member of the steering committee which will be set up to consider the applications for which a computer is considered to be suitable and the first task of this Committee will be to appraise the accounting procedures and equipment in use. The auditor should be consulted at as early a stage as possible and certainly before the programming stage has been reached, so that he will be able to make any recommendations to improve the controls to be implemented without difficulty.

## *Basic Approach*

(*a*) *Internal Check and Control:* The auditor's primary concern in any computer installation will be to see that the principles of internal check and control have been effectively applied to the procedures as a whole and to each section as necessary.

(*b*) *Input:* He will examine the procedures for establishing the authenticity and control of prime documents and the validity and correctness of input media.

(*c*) *Processing:* The whole of the processing operations will be surveyed to confirm the reliability of the machine and that the intended results will be produced. It will be necessary for the auditor to consider the adequacy of the programs and their validity.

(*d*) *Output:* He will see that the normal internal check controls are exercised over output records, where printed out, and that effective measures are taken in other cases.

## *Breakdowns*

The necessity for the pre-planning of alternative arrangements to be used in the event of breakdowns is evident; the auditor should find out what arrangements are prescribed, to enable him to consider whether the efficacy of the control and internal check will be in any way relaxed thereby.

# STATISTICAL METHODS

*Groups 15 and 16 met together at the beginning of the session and divided into four groups:*

*15a: the increased use of linear programming for solution of management problems,*
*15b: retrieval of significant information from detailed records,*
*15c: market research and sales forecasting, and*
*16: industrial experimentation and quality control.*

*A combined meeting was held at the end of the session.*

Group 15*a* stresses the need for accurate and sensitive data, if accurate solutions are to be obtained. Manufacturers have been circularised and information collected regarding the size of problem which can be handled. Programs are available on five computers (three British).

Group 15*b* considered a sales analysis in which it is desired to select significant information. Sampling techniques are excluded; an output is specified with variable parameters, and an outline flow chart prepared; a specialised version of this has been programmed by a member of the Group.

Group 15*c* considered the following topics:

(*a*) short term sales forecasting in the chemical industry,
(*b*) service bureaux applications of a computer to market research problems, and
(*c*) problems of sales forecasting in the ice-cream market.

Group 16 reports that the subjects in its field are important to industry and have a reasonably extensive literature. The advent of the computer does not appear to have affected the class of calculations made. It is felt that the study should be pursued next session by a large group, more broadly based.

# PAYROLL AND LABOUR COSTING

*To provide topics of convenient scope for discussion the subject considered by Group 17 was broken down to the following headings:*

(*a*) *economics of the application of computers to payroll,*
(*b*) *the nature of the information required to be provided by a mechanised system,*
(*c*) *input of information, and*
(*d*) *maintenance of master records and provision for checking and audit.*

## *Economics of a Computer on Payroll*

It will normally be very difficult to justify the installation of a computer purely to perform payroll calculations. Worthwhile economies can be achieved if

(*a*) the machine is installed primarily to deal with other work but machine time is available for payroll,
(*b*) other information can be extracted from the payroll operation which is not currently available (or only at a heavy cost), and
(*c*) input information for payroll can be derived as a by-product of other routines which have been or are about to be handled by the machine.

## *Information Required*

In general the normal form of calculated output in terms of wages cannot be greatly changed from the conventional pattern.

On the other hand, the costing requirements of different industries vary considerably. In general a large number of fixed analysis codes are required by the process type of industry, although these may not be in continuous use, and a smaller number of codes, which are frequently changed, by the contract or job cost industries.

Computer processing will offer considerable advantages where it is required to compare in detail actual costs with predetermined standards and to print a control report where variances exceed a programmed amount.

Attention should be given to the form of cost analysis codes. Those currently in use are frequently unsuitable for mechanical processing or uneconomic in storage, particularly where alphabetic characters are included.

Other information which might be produced includes absence and lateness statistics, employment statistics, individual performances in piecework and other schemes, overtime, plant utilisation, employee personal accounts, accumulated holiday credits.

## *Input of Information*

In wages calculation the automatic recording of clockings for direct processing by a computer can afford considerable savings. A Canadian machine is already available for this task; British machines are under development.

Other methods in use for recording this information are:

(*a*) Punching actual clockings direct on to tape or pre-punched cards from clock cards, or punching the hours worked which have been extended clerically and checked.
(*b*) Mark sensing hours worked after clerical extension; this has the advantage of enabling staff normally employed on other work to deal with any peak loads. A rate per hour of at least 120 cards marked in ten to twelve columns can be maintained and with careful training a high standard of accuracy achieved. An additional advantage is that any errors found can be easily erased.

## *Master Records*

Where master information is kept on magnetic tape there is a danger of accidental erasure; since a manually produced document will be required to initiate amendments to the master record tape (or other storage used), provision should be made for the permanent retention of these documents to form a visual record against which doubtful items can be checked.

Particular attention should be given to the problem of alteration of master information as a result of general changes in wage rates following wages awards, or in deductions following changes in the rate of National Insurance contributions.

In payroll work an emergency system for use in case of serious breakdowns should be fully planned and understood by both the management and employees.

# STORES CONTROL

*Group 18 considered that the detailed application of EDP to Stores Control depends on the requirements and circumstances of each specific application. The Group therefore discussed general principles of importance in all Stores Control applications.*

## *General*

Within the administrative sector of business operations the advantage of data processing of stores lies rather with the possibilities of curtailing investment in stock than in saving personnel.

There is no standard detailed method of mechanised stores control suitable for all types of stores, and it would be wrong to suggest that any system of data processing can be wholly automatic. The most that should be expected is for the machine to handle the mass of detail and provide information analyses.

## *Classification and Coding*

The first essential for efficient mechanical analysis is that the items be clearly identified on a numerical basis. The coding should reflect the pattern of the classification structure, and preferably be numerical, short, of constant length within a defined class; it should be capable of absorbing new items without disruption of the systematical classification.

A properly designed system of classification and coding

simplifies analysis and enables greater accuracy of reports by facilitating the recognition of "Categories" and "Levels" of information from the "General" to the "Specific."

### *Selective Control*

In many industries a very large percentage of stock in terms of value is concentrated in a very small number of items. Since it is these expensive items that offer the greatest potential economy, a control can be arranged to provide information for reviews at short intervals with the possibility of diminution in the size of the buffer stock.

Where the value of stock and consumption is extremely small in relation to the number of items involved, the system might be simplified to the maximum extent, even so far as to allow such items to be handled with few or no paper controls, and with re-ordering reviews on a global basis.

Between these two extremes, variations in the degree of control may be possible.

### *Inventory Controls*

Data processing methods can be used, varying from the provision of data needed to investigate re-ordering requirements to the possibility of the computer actually prognosticating apparent future needs. Such forecasts should be regarded as advice, not as decisions. The final decision must be man made.

In determining the quantities of each material to be ordered for replenishment of stock, it may often be advantageous to calculate the "economic ordering quantity," for which a suitable formula can be drawn up to cover varying sets of circumstances. The purpose of this method is to determine the point of equilibrium between the cost of frequent small orders and the cost (including interest on idle capital) of storing and handling large stocks.

### *Internal Economy*

Data processing for stores control should generally be on a day-to-day basis, especially in the preparation of input material. In handling later stages of operation this will probably involve a higher total of machine utilisation, but against this there are certain advantages, such as

(*a*) the work is spread evenly over the period, with no peak loads that interfere in other routines,

(*b*) results are always up-to-date, with the minimum lapse of time before remedial action is taken, and

(*c*) the data can be used on a day-to-day basis for other sections of the business (e.g., works control).

## SALES ACCOUNTING

*Group 19 considered that it was not desirable to recommend to the Society any specific procedures applicable generally to Sales Accounting, as the methods to be employed are governed strictly by the requirements of each case.*

*Members engaged in planning and installing applications were disinclined to make firm recommendations, even though related to their own specific requirements. Such recommendations can be misconstrued as considered views based upon working experience, and can be misleading to other members reading reports of the Group's proceedings without background knowledge which could only be secured by personal attendance at meetings. As one member put it, the only really satisfactory practical approach to overcoming the problems involved is "to get on with the job" and to learn by experience.*

## GENERAL ACCOUNTING

*Group 22 defines General Accounting, as a computer application, as the production of such periodic information as management requires at all levels, building up to monthly or four-weekly Trading and Profit and Loss Accounts based on a flexible system of Budgetary Control, with further stages of quarterly, half-yearly and annual accounts, such annual accounts also to be produced in the legal form.*

*From this it follows that the computer has in effect to do the book-keeping aspect in some form and, either at the same time or as a subsequent operation, produce a set of accounts or returns to provide management with control figures.*

### *Form of Account*

Three main levels of account are envisaged:

(*a*) legal accounts, reconcilable with

(*b*) management accounts, analysed to functional or management levels or both, and

(*c*) cost accounts, being further analyses of parts or the whole of certain management accounts.

*Frequency of Production:* In theory this is a matter of balancing the decreasing value of less frequent information against the increasing cost of more frequent preparation of information. In practice it will probably be a matter of four- or five-weekly periods or both.

*Comparison with a Budget:* The Company organisation will decide the form of the budget which, in turn, will largely decide the form of the management accounts. Automatic budget comparison and control is a special feature of the computer and can introduce a good deal of management by exception, coupled with an automatic variance analysis.

*Time Basis of the Account:* Moving annual totals which cater for problems of seasonal trade are considered the most generally applicable accounting bases and well within computer capacities. It may also be possible to project the current year forward by forecasting on present trends.

*Presentation:* It is important to bear in mind the desirability of restricting output of information to what is legally necessary and what is necessary as an aid to making decisions. All such information should be organised in such a way as to indicate the reason or responsibility for the result.

### *Book-keeping Aspect*

As much general accounting information as possible should be generated as a by-product of the main specialised routines (such as payroll, stores, invoicing, etc.). It follows that the

specialised routines must be so organised as to provide this information in addition to anything required for specialist management.

Depending on the size of the computer, general work can be effected and stored during a specialised run (such as invoicing) or would require separate processing of the initial or summarised data. Again depending on volumes of work and computer capacities, general data from one specialised routine should be amalgamated with general data from another in single or multiple runs.

The double-entry concept presents no difficulties to a computer, and in fact some firms have General Accounting systems on punched cards, mainly by treating each transaction as a separate journal entry.

At least some records and accounts should be available in visible form (e.g. plant registers). Auditors would in general prefer more than less visibility. It is exceedingly difficult and/or expensive to program the machine to cater for all the exceptions and trends which would be apparent in visible records to the experienced eye. The current procedure of using copy documents (of invoices, etc.), is a part solution to visibility/economy problems.

## *Coding*

Some form of dynamic code may allow the double-entry concept of accounting to be discarded; until such a code is developed, however, a duplex code is envisaged whereby all basic input will eventually update all the accounts concerned, both debit and credit. The code should be concise, but comprehensive enough for sufficient analysis.

One of the main problems is to obtain the correct code when the documents are created, and to restrict transcription of figures from one document to another. Mark-sensing at the source is a step in the right direction, so long as it is accurate, but the main problem is the organisational one of ensuring accuracy.

## *Conclusion*

Computers and associated techniques (operations research, etc.), may have a revolutionary effect in future on accounting principles. In the meantime, conventional accounting techniques, which take a static rather than a dynamic view of transactions, are not likely to make full use of the resources of computers.

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# DIGITAL COMPUTERS IN THE STEEL INDUSTRY

The Operational Research Department of The British Iron and Steel Research Association held a one-day conference in London on 15 April 1958 on digital computers in the steel industry. Demonstrations of the BISRA Ferranti PEGASUS Computer were given on the previous and following days by members of the Computer Applications Section which had been established by the BISRA Council in 1956.

Shortly before their computer was delivered a booklet describing its functions, with examples of how it might be used, was circulated to the managements of member companies. In the foreword to this booklet the Chairman of BISRA Council stressed the difficulty within the industry of recruiting appropriate additional labour to implement its development plans and the need to make managements aware of the potential uses of the new equipment so that they might consider how computers could be used.

Papers presented to the Conference by staff from steel companies already using computers and from the Computer Applications Section of BISRA included the following:

1. "Experience in Using a Computer for Payroll" by J. S. Pugh (*Guest, Keen and Nettlefold—Screw Division*): a pilot scheme for payroll in the G.K.N. Group of Companies.
2. "A Simulation of Melting Shop Operations by Means of a Computer" by R. Neate and W. J. Dacey (*The Steel Company of Wales Ltd.*): a program which has been coded for PEGASUS to obtain an estimate of the shop's production capabilities when using preheated combustion air enriched with oxygen, and to establish which services and ancillary equipment are likely to be the limiting factors where congestion is likely to occur.
3. "The Use of a Computer in a Rolling Mill Office" by R. G. Massey (*BISRA*): a feasibility study carried out by the O.R. Department of BISRA into the possible use of computers in the rolling mill office of Dorman Long (Steel) Limited.
4. "Training for Computers" by D. G. Owen (*The United Steel Companies Ltd.*): problems of training programmers, advising management and training for specialist users such as production controllers, accountants and engineers.

Inquiries regarding the above papers or the BISRA Computer Installation should be addressed to the Computer Applications Section, Operational Research Department, The British Iron and Steel Research Association, 11 Park Lane, London, W.1. The BISRA Computer is available for use by staff of BISRA member companies and limited assistance is given with the preparation of programs.

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## *Programming by Correspondence*

A correspondence course on programming for Business Computers is now available in this country. Based on a similar course devised by Business Electronics Incorporated of San Francisco for an American University, the aim is to teach by home study the technique of programming such business problems as payroll, debtors accounting, stores control, etc., basing the exercises on an imaginary computer, the BEC.

The President of Business Electronics is Mr. F. H. Bergtholdt, Manager of the Electronic Data Processing Research Division of the California Packing Corporation, and the Director of Education, Mr. J. H. Herrett, is his assistant there.

# A CASE STUDY IN COMMERCIAL ELECTRONIC DATA PROCESSING

*Some extracts from a joint talk by*

*D. S. Greensmith, M.B.E., A.C.I.S., General Office Manager, and*
*J. G. Thompson, A.C.I.S., Chief Programmer*

*of Boots Pure Drug Company Limited at the Caxton Hall, London, on* 17 *March* 1958

1. Boots Pure Drug Company Limited started to examine the possibility of using a computer in 1953–4. The following points contributed to the general situation:

(*a*) The Company's turnover had expanded consistently year by year since the last war, and there was every reason to believe that it would continue to do so.

(*b*) The Company's highly centralised offices were not extensively mechanised.

(*c*) There was reason to hope that capital expenditure, which in turn had been devoted to research, production, distribution, and retail branches, could be devoted to the development of the office function.

(*d*) The Company's offices were centralised in Nottingham, and it was not likely to be easy to continue to increase the clerical staff in that city of light industry employing a large proportion of women.

2. The Company's main activities (*see Figure 1*) include research and development laboratories, primary production of chemical compounds, antibiotics, steroid compounds, etc., and secondary production of pharmaceuticals and toiletries. These, together with factored goods purchased by buyers, and a small amount of production from printing and art departments, find their way through warehouses situated in five geographical locations to the selling organisation. The Company organisation employs more than 38,000 people, and of these some 2,000 are employed in the centralised clerical function.

3. The Organisation and Methods Department, established for more than twenty years, has consistently contributed to improvements in efficiency.

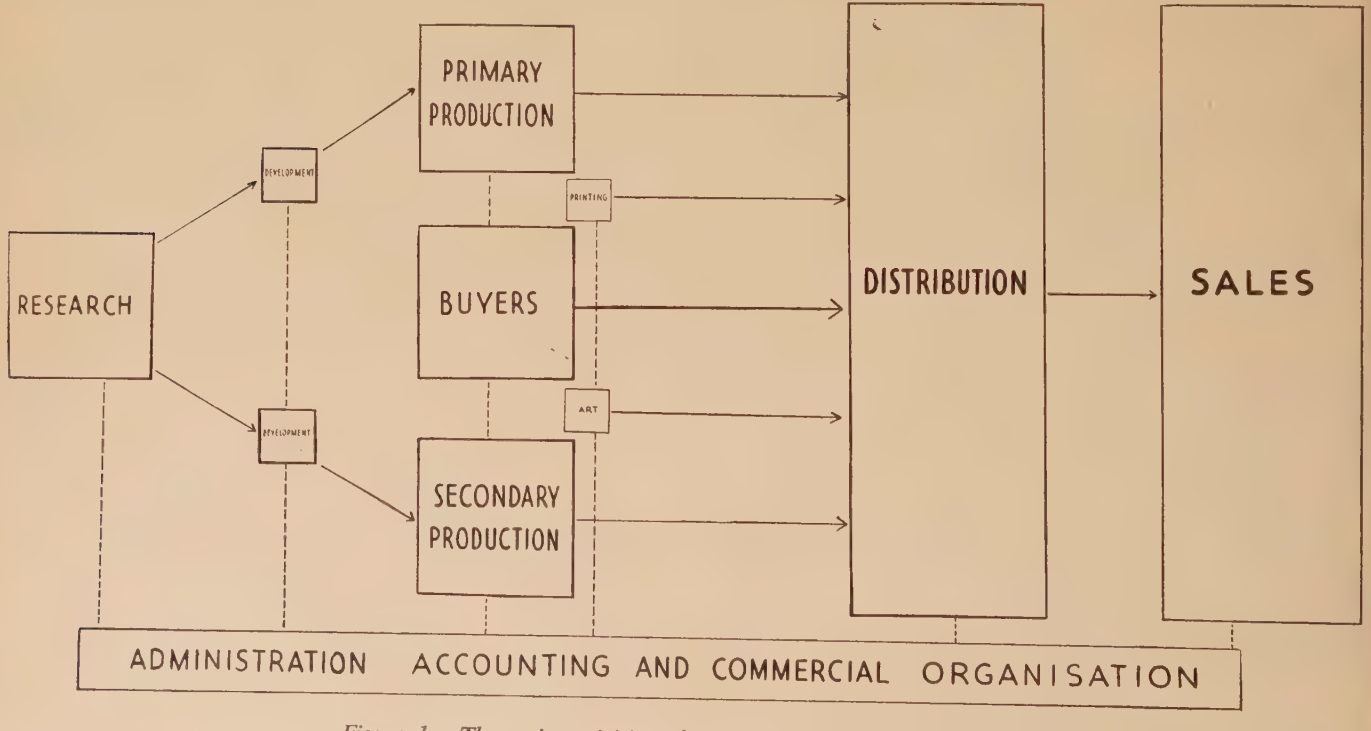


*Figure 1.—The main activities of Boots Pure Drug Company Limited*

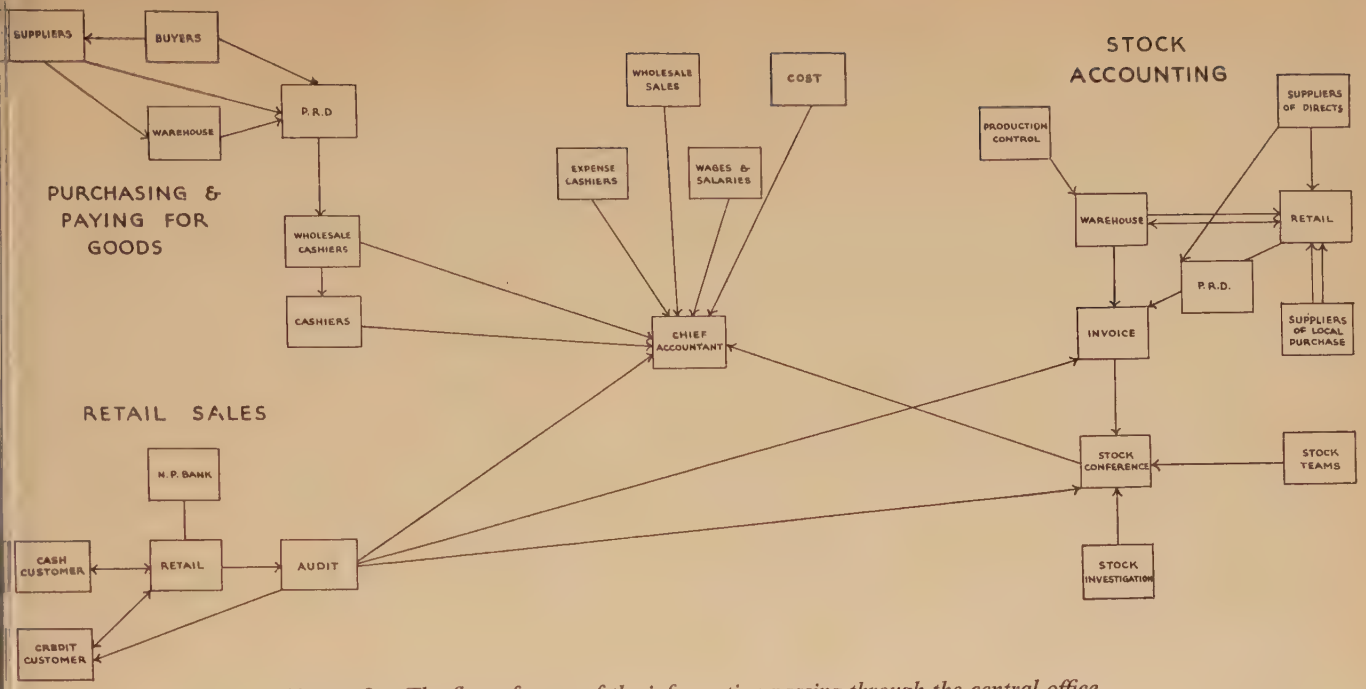


*Figure 2.—The flow of some of the information passing through the central office*

4. There are eleven main groups of merchandise, and the total inventory is some 60,000 items.

5. Each year the Company makes some 380 million unit sales.

6. The team to investigate commercial EDP is responsible to the Finance Director. It is headed by the General Office Manager and includes O. and M. personnel, plus programming and processing representatives who were appointed at the outset. A Committee of Reference has been consulted throughout. Represented on that Committee have been Buying, Accounting, Distribution, and Retail interests.

7. The flow of some of the information passing through the central office is depicted in *Figure 2*. Retail branches place fortnightly orders on the warehouse in a time-staggered sequence. Centrally a trading account is maintained for each branch which yields a monthly theoretical stock balance.

Approximately twice each year, stocktaking teams visit each branch and take a physical stock count. Significant discrepancies are considered at a weekly stock conference.

Ninety per cent of sales are for cash to the general public, the remainder being on credit mainly to doctors and farmers.

In the retail branches there are 7,000 potential cash register positions and, of these, only 1,000 are equipped at the present time. Hand-written sales bills are used elsewhere.

8. The team's first conclusions indicated that the use of an EDP system could be considered with advantage in a number of fields.

It was felt that computers could be used to mechanise certain clearly defined existing tasks—payroll, for example—but that truly integrated applications were likely to be more fruitful.

9. With this policy in mind, a small computer was ordered in 1955 to deal with payroll, the object being to gain experience. Delays in delivery date and increases in price resulted in this order being cancelled.

10. Following an extensive tour in the United States of America early in 1956, and the inspection of equipment available in that country, an order was placed for an Underwood ELECOM 125 Data Processing System. Considerable progress had been made in programming work for this machine, and some programs were ready for testing in New York when the Underwood Company announced that it was cancelling any orders for this equipment and would not in future make any large-scale computer systems.

11. The Company then decided to place an order for an EMIDEC computer, details of which had not been announced until after the decision had been made to place an order with Underwood.

12. Ideally, in a business similar to Boots, which covers all phases from retail selling back to basic research and production, true integration can be achieved by capturing a mechanical record of every transaction at the point of sale and using this record to give sales analysis, cash control, stock control, production control, etc. Human and organisational rather than mechanisation problems make it difficult of achievement in the immediate future. It remains the Company's long-term aim.

13. Having in mind the long-term aim, it was agreed to start at the point where the branches order goods from the warehouses. There are several classes of order —stock, supplementary, and special—each of which requires different treatment. The procedure for placing orders is being redesigned so that they can be converted to machine language. Experiments are being conducted to achieve automatic input.

The aim is to produce mechanically the delivery notes, a record for each branch manager of the goods received at the branch, a simple account for stock control for each branch and for the warehouses, and records for buyers to place and follow up orders.

Documents must be produced for the warehouse to cover the assembly of each order and the checking of it as well as the delivery note. Buying Offices will first be given full records of stock movement plus a warning when stock falls below a given level. It is hoped this will give them confidence in the system and that later they will agree to receive tabulations only of items requiring attention, together with statistics showing how the demand of branches is varying so that future purchases can be planned. A *to-follow* system for unfulfilled orders will be included.

The Accounting Departments will be given details of the additions to the stocks at each branch in the form of a printed invoice.

14. Some of the main facts and figures about Boots merchandise accounting are set out in *Figure 3*. Magnetic tape was essential for economic working as was extensive storage inside the computer. The amount of computing is limited but a great deal of sorting is necessary in order to marshal the orders for warehouse assembly purposes. Any installation must cover future expansion of the business.

15. The ELECOM 125 had been selected partly because of its extremely valuable separate file processing unit.

After the Underwood Company cancelled the order early in 1957, Boots examined thirty-one systems in all, ranging in the United States of America from the E 101 to the IBM 709, and in Great Britain from the PCC to PERSEUS. The final choice was narrowed to five systems:

(*a*) One LEO with two magnetic drums, two high speed printers and magnetic tape units.

(*b*) Two Elliott 405's including double disc storage and high speed printers.

(*c*) Two IBM 650's plus two RAMAC's each.

(*d*) One IBM 705.

(*e*) One E.M.I. EMIDEC.

The EMIDEC was eventually selected because of its price, multichannel input and output, magnetic and punched paper tape facilities, massive high speed internal storage and high speed printed output. It also included

## MERCHANDISE ACCOUNTING FACTS AND FIGURES

### INPUT

70,000,000 items ordered per year
Peak load 300,000 items per day

Characters per item: 4 letters + 1 to 3 figures
Characters per day: 2,100,000

### MAIN OUTPUT

One printed line per item: 300,000 lines
Document headings: 50,000 lines

Lines of print per day: 350,000 lines

Characters and spaces per line: 60
Descriptions: alphabetic
Quantities: decimal and sterling

### SUBSIDIARY OUTPUT

Alphanumeric Exception Reports
(concurrent with main output): small volume
Periodic Reports: small volume

### STORAGE

Items in Inventory: 60,000
Items per Department for processing: 1,000 to 12,000
Decimal digits per item: 100

Branch Accounts: 3,300 Accounting Units
Decimal digits per unit: 25

### TIMING

Order processing: daily
Branch Accounts: monthly
Reports—

Out of Stock: daily
Critical Stock Level: daily
Appropriations: weekly
Re-order: daily

*Figure 3.—Some of the main facts and figures relating to the Company's merchandising accounting*

automatic conversion of decimals and sterling to binary and two drums each of sixteen thousand words. The double buffers for additional speed of input and output were an added attraction.

15. Approximately fifteen people are engaged in the investigation, programming, and organisational work. Systems investigators work in teams of three. Programming and processing representatives have worked with the methods investigators throughout, and this has been an extremely important feature.

16. A pilot scheme has been devised in order to test out various aspects of the new methods.

17. A flow chart of the data processing operations is given in *Figure 4*.

18. The following interesting facts have emerged as a result of more detailed programming:

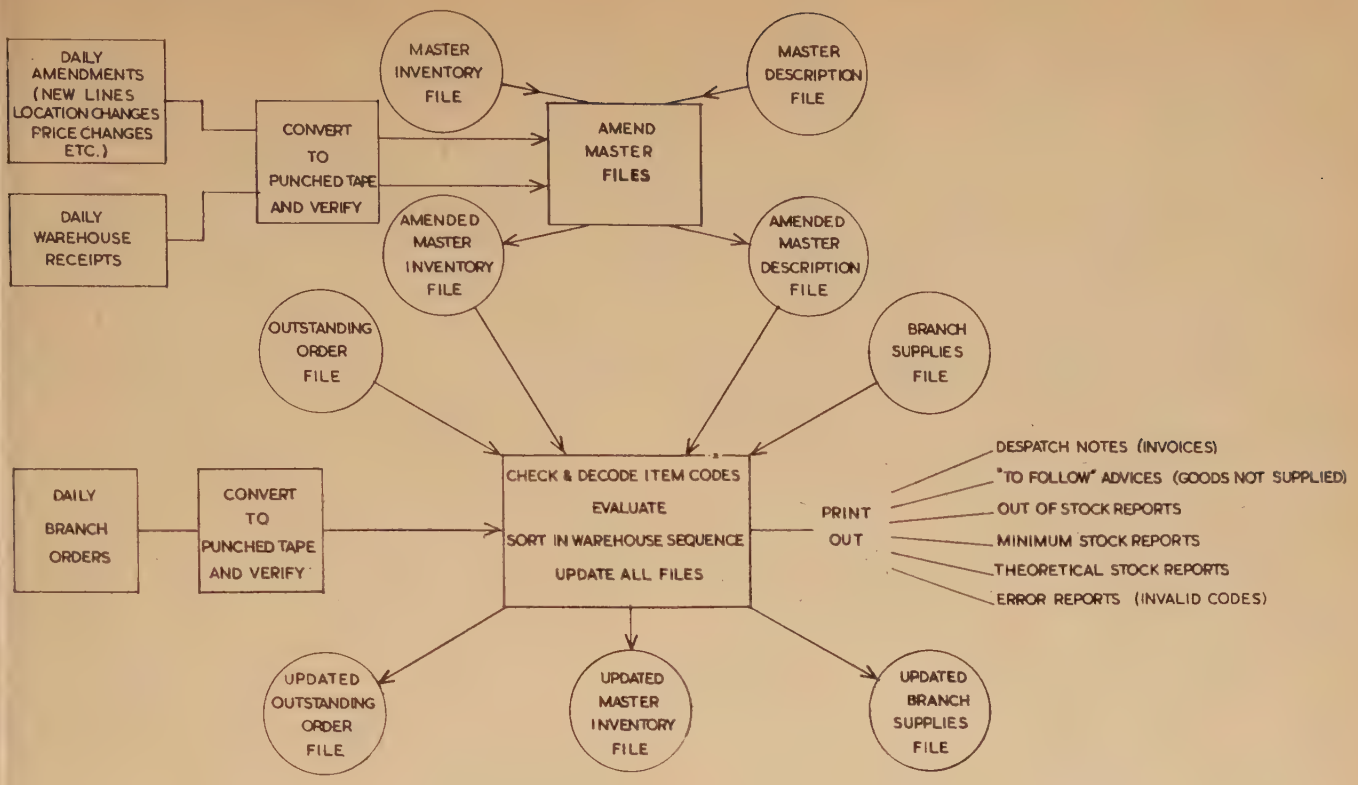


*Figure 4.—A flow chart of the data processing operations*

(*a*) Despite the vast volume of daily input, punched paper tape has proved to be fast enough.

(*b*) Despite the size of the high speed core store, it is still not large enough for sorting the biggest orders which therefore have to be dealt with in parts.

(*c*) Considerable care is necessary in programming the printed output as the printers work in cycles. Signals to print must be given in time for the beginning of a cycle if output is to be maintained at the maximum rate.

(*d*) A massive magnetic tape record would be necessary to give details of issues of each commodity for each of the last ten days if moving totals are to be calculated for the detection of critical stock levels.

(*e*) Commodity descriptions must be reduced to a regular size to facilitate output on the Samastronic printer.

(*f*) As is the case with many other installations, methods and programming work was under-estimated at the outset.

19. Various media have been used to maintain communication with management and staff. An appreciation and more detailed training programmes have been devised. Various members of the Board and a complete cross section of top management attended the first training course.

If targets are achieved, staff savings will be made. However, redundancy does not appear to be the main problem. It is rather one of redeployment and retraining.

20. Many difficulties have been encountered already; without a doubt there will be many more. It is certainly true to say that we have learnt many lessons from our failures to date. Despite these problems, the Company remain convinced that electronic data processing has much to offer. The earning capacity of such a system is perhaps more important than its ability to produce savings.

It is obvious that there is still much development work required insofar as equipment is concerned. Boots have considered it worth while to finance research, both at a University and with a commercial organisation.

21. In addition to the computer plans envisaged above, a Solartron Electronic Reading Automaton has been ordered, and this will be coupled to a special purpose computer to be built by Elliott Bros. This equipment is to be used for the preparation of sales analyses and cash control information.

* * *

## *DISCUSSION*

1. Mr. E. C. R. Williams (*Unilever*) asked about qualifications of programming staff. Mr. Greensmith said that the first essential for the leader of a programming team was an intimate knowledge of the Company. In Boots' case, they had chosen an employee who had been with the Company for many years, had a detailed knowledge of many clerical Departments, had considerable experience of electronics in the R.A.F. during the war years, had studied radio and

television as a hobby, and possessed the logical and mathematical type of mind so essential for writing programs. A University graduate with mathematical and statistical qualifications had also been recruited. IBM aptitude tests had been of some use.

2. Mr. Clear Hill (*de Havilland*) enquired about the education of staff. Mr. Greensmith said that there were regular meetings of Managers, Supervisors, and senior women. Information was also given in the House Journal and in the Management Newsletter and they were now starting three-day appreciation courses and one-week courses on dealing with the new data.

3. In reply to a question by Mr. Paine (*Shell-Mex & B.P.*) Mr. Greensmith said that the total investment would be in the region of £250,000, but this did not include the 7,000 cash registers which would eventually be required.

4. Mr. Micklewright (*British Petroleum*) asked how a time series could be recorded if records were constantly updated? Mr. Thompson said that the backing store of 100 digits on each record included accumulated issues. Issues during each of the last ten days would be on a separate tape. Some documents would be kept for a year to facilitate analysis if required.

5. Mr. T. G. Burge (*National Coal Board*) enquired about the reactions from the auditors. Mr. Greensmith said that these people would be brought into the final discussions.

6. In reply to a question from Mr. T. C. Hickman (*Unilever*), Mr. Greensmith said that E.M.I. would carry out the maintenance of the equipment for the first year, but Boots had engaged an electronic engineer with eight years' experience, who was starting to gather together a staff which would be sent to the manufacturers for training. This staff would maintain all the equipment.

7. Mr. E. C. R. Williams asked whether there were not difficulties in programming a computer if you could not test your program on an actual machine? Mr. Thompson said that there was indeed a sense of frustration until a program could be tested, but ultimately the resulting program would be better from the long attention devoted to it.

8. In reply to a further question from Mr. T. G. Burge, Mr. Greensmith stated that the heat dissipation and air conditioning requirements were much less for the EMIDEC than for American machines, and an existing building was being modified to provide accommodation for the new equipment.

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# INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL (IFAC)

The International Federation of Automatic Control, founded in Paris in September 1957, has now started work. The Constitution has so far been ratified by the following twelve national organisations, which have thus become members of IFAC:

| | |
|---|---|
| *China:* | Chinese Association of Automation |
| *Czechoslovakia:* | Laboratory for Automation and Telemechanics of the Czechoslovak Academy of Science |
| *Denmark:* | Institution of Danish Civil Engineers |
| *Italy:* | National Research Council |
| *Japan:* | National Committee of Automatic Control, Science Council |
| *Norway:* | Norwegian Engineering Society |
| *Poland:* | Polish Committee for Automatics |
| *Roumania:* | Commission for Automatics, Academy of the Roumanian Democratic Republic |
| *Sweden:* | Swedish Joint Committee for International Conferences |
| *Switzerland:* | Swiss Association for Automatics |
| *U.S.A.:* | American Automatic Control Council |
| *U.S.S.R.:* | National Committee for Automatic Control |

Applications for membership from other national organisations are expected shortly.

The Executive Council and the Advisory Group met in Zürich in March, with President H. Chestnut (USA) in the chair. The formation of Technical Committees was agreed on the basis of suggestions made by the Advisory Group, which was presided over by D. P. Eckman (USA), on Bibliography, on Nomenclature, Symbols and Definitions, and on Educational Questions. These Technical Committees will be combined into three main IFAC Committees, on Automatic Control Theory, on Components and Measurements, and on the Application of Automatic Control.

The first IFAC Congress for Automatic Control is to be held in Moscow from 25 June to 5 July 1960. An IFAC Bulletin is to be issued and distributed shortly by the IFAC Secretariat (c/o Verein Deutscher Ingenieure, 79 Prinz-Georg-Strasse, Düsseldorf, Germany) to member organisations and will contain more detailed information on the Congress. The manuscripts of papers for the Moscow Congress have to be submitted to the member organisations by Summer 1959.

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## *American Conferences*

The dates of a number of annual American conferences have been announced recently. The International Automation Congress (and associated exhibition) is being held in Pittsburgh this month (June), as is the Fourth International Automatic Exhibition at the New York Coliseum. From 13 to 15 October the IRE National Electronics Conference will be held in Chicago; the Fourth IRE Instrumentation Conference will be held in Atlanta, Georgia, from 17 to 19 November; and the AIEE, IRE and ACM Eastern Joint Computer Conference is planned for Philadelphia, Pennsylvania, from 3 to 5 December.

# SOCIETY AND COUNCIL NOTES

## Special Summer Meeting

There will be a Symposium on "Automatic Programming" at the Northampton College of Advanced Technology, London, at 2.30 p.m. on Friday, 1 August. Dr. John W. Carr III will open the Symposium with a talk on "The Theory and Practices of Automatic Programming in the U.S.A."

After a break for tea and biscuits there will be a talk on some aspect of British experience in this field. Each talk will be followed by a discussion.

Dr. Carr is Professor of Mathematics at the University of Michigan, and has been President of the Association for Computing Machinery from 1956 until this year. He was one of the original team of programmers of WHIRLWIND I at the Massachusetts Institute of Technology, and in 1951 spent several weeks at Cambridge University programming EDSAC I. At Michigan he has played a leading part in the application of the University's own computers, MIDAC and MIDSAC, and has organised innumerable courses on computer applications.

He is particularly interested in automatic programming, and through the A.C.M. he has devoted considerable effort to fostering and co-ordinating automatic programming developments in the U.S.A.

## Annual Subscriptions

Members are reminded that subscriptions for 1958–59 became due on 1 May. Individual reminders have been sent to all those whose subscriptions are overdue; any whose subscriptions have still not been paid by 31 August may be removed from the register of members.

## Regional Groups

The following is the full list of Regional Groups formed by Council with effect from 1 May 1959—

| *Regional Group:* | *Regional Branches Covered:* |
|---|---|
| Scottish | Glasgow |
| Northern | Middlesbrough and District (forming), Newcastle and District |
| Yorkshire | Hull and East Riding, Leeds and District, Sheffield and District |
| North Western | Liverpool and District (forming), Manchester and District |
| East Midlands | Leicester and District (forming), Nottingham (forming) |
| West Midlands | Birmingham |
| South Wales and Monmouthshire | Cardiff and District |
| South Western | Plymouth (forming) |
| London | London |

## Study Groups

The Study Group Sub-Committee of the Business Group has been considering the organisation necessary for the continuance of Study Group activities for the 1958–59 session, based on their experience of the past year. Groups for next session will comprise both those which are continuing from the past session, with added members, and new groups as required. No attempt will be made to form groups for preliminary training, as it is considered that this is essentially a function for technical colleges. Each group will be asked to keep a record of its discussion and to compile a progress report on its work by the end of the session.

Subjects for study will be related to type of application, function or activity, and not to type of machine. Members are strongly advised not to apply to join more than one group (and will not in any case be permitted to join more than two groups), as experience has shown that regular attendance by the participants is essential to useful work. Details of the new groups and application forms will be circulated shortly to all members.

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# LONDON MEETINGS

## A Case Study

The March meeting of the Society was held in the Caxton Hall, London (as reported briefly in our last issue), when Mr. D. S. Greensmith and Mr. J. G. Thompson, of Boots Pure Drug Company Limited, gave an interesting account of the progress made in that company towards the installation of EDP.

Some extracts from their talk are given elsewhere in this issue of the *Bulletin*.

In moving a vote of thanks to the speakers, the President, Dr. M. V. Wilkes, said that it warmed the heart to find a British company adopting a progressive attitude towards the mechanisation of clerical work and being prepared to finance development of special equipment. He also wished to congratulate the speakers on the able way they had presented their subject.

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## Symposium on Translation

A most successful Symposium on the mechanical translation of languages was held at Birkbeck College, London, on 17 April. The first of its kind to be organised by the Society, the Symposium attracted about 80 members and guests.

Dr. A. D. Booth (Birkbeck College), who was the Chairman, opened the meeting by giving a brief history

of mechanical language translation. The first proposal to use a digital computer for this purpose was made in 1946, and he recalled how he and Dr. R. H. Richens first programmed the construction of a dictionary. The first International Conference on Mechanical Translation was held in 1952, and at about this time the Nuffield Foundation made a grant to support the development of these new techniques at Birkbeck College. As a result Mr. L. Brandwood joined the staff to study problems of resolution in French and German.

Reminding his audience that so far all work on this problem had been done on general purpose digital computers, Dr. Booth said that a special purpose computer for mechanical translation was being constructed in the United States; one of its special features would be its very large non-eraseable store to hold the dictionary. It was expected that this machine would be operating this year.

In presenting the first paper, on "Some Problems in Translating German," Mr. L. Brandwood (*Birkbeck College*) dealt with problems which arise with the relative pronouns *der*, *welcher* and *was*. The main difficulty lies in relating these pronouns to their antecedents when a word-by-word translation is made. He analysed the difficulties which arose in various examples and commented on the rules which could resolve some of the ambiguities. It appeared that a few simple rules would handle 80 to 90% of the problem cases. Special rules could be used to deal with the remainder, but these cases could probably be resolved at the post-editing stage.

After tea, Dr. A. F. Parker-Rhodes (*Cambridge University*) read a paper which he had prepared jointly with Dr. R. M. Needham (*Cambridge University*) on "The Mathematical Treatment of Thesaurus-type Machine Translation." The thesaurus was presented as a lattice of the meets and joins of all possible lines from a number of basic attributes. For example, Dr. Parker-Rhodes produced a lattice for domestic animals and used such basic attributes as class of animal, sex, age, etc. Thus a possible join for the attributes *horse*, *female*, *old* would be *mare*. The method is first to code the input language into its component attributes on the basis of a contextual analysis. The thesaurus for the target language is entered with these attributes, and a search made for a point in the lattice which has (ideally) complete parity with the attributes of the input. Where this is impossible, the next nearest join (defined by certain rules) is taken to be the closest representation. As an example of the search techniques being developed, it is now possible to search a 1,000-element lattice in about 16 milliseconds on EDSAC 2.

Dr. R. H. Richens (*Commonwealth Bureau of Plant Breeding and Genetics*) then spoke on "Interlingual Machine Translation." He described an artificial language, or *interlingua*, which, when once constructed, could be used for the translation of any pair of languages, in conjunction with the specific dictionaries for each of the input and output languages. In this *interlingua* a series of letters are used each of which denotes some basic conception such as *animal*, *sex*, *feeling*. The idea to be conveyed is then constructed by sets of bonds which define the necessary relationships between the basic conceptions. The bonds are written as superscripts to their associated letters. Dr. Richens pointed out that it should be possible to devise rules for preparing abstracts of literature when in the *interlingua* stage.

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## *Research Statistics*

On 21 April, in the Caxton Hall, London, more than a hundred members heard Dr. Frank Yates, Head of the Statistics Department of Rothamsted Experimental Station, talk on the use of a computer in research statistics, based on four years' experience. Outlining the work of the Station's Statistical Department, he explained that, although their computations tended to be complex, their data handling was less voluminous than in business statistics. Research statistical analysis was often exploratory with need for results at intermediate stages.

Dr. Yates said that they had tried to organise the routine analysis of replicated experiments on punched card machinery but they had found that with available equipment such computations could not be carried out efficiently. So they began to take an interest in electronic computers and in 1954 the ELLIOTT/NRDC 401 was installed; this now has a punched card reader and recently the number of immediate access stores has been increased.

They realised early on the value of organising the work so that data tapes could be prepared easily from field documents; overall efficiency was gained by doing all possible computations on the machine. They had found it essential for a variety of results to be available to the user; printing requirements are either specified in advance by control words on the data tape or by the operator using the hand switches. Results are printed in a form which require a minimum of annotation before being sent away. They have prepared a special routine to handle analyses when some of the observations are missing.

Programs for the analysis of replicated experiments are lengthy and it has been found worth while preparing machine aids. One such machine aid program takes a set of instructions with dummy addresses and replaces these with correct machine addresses, finishing up with a completed tape. Another useful routine prints out a program in sets of logical sequences of orders as they would be obeyed, following all jumps in sequences which arise.

Dr. Yates then showed slides illustrating the increase in the turnover of productive work, facts about machine utilisation, and the trends shown over the past two years. He concluded with some comments on probable future work.

# REGIONAL NEWS

## *Hull and East Riding*

The inaugural meeting of the Hull and East Riding Branch of the Society was held on Wednesday 12 March 1958 at the Yorkshire Electricity Board Showrooms, Ferensway, Hull. The main speaker was Mr. A. J. Barnard, City Treasurer of the Norwich Corporation.

Dr. A. S. Douglas, Director of the Electronic Computing Laboratory at Leeds University, was in the chair and opened the meeting with a welcome to the audience of over 150 people. He went on to explain the formation, history and objects of the Society and its branches, and gave details of the publications issued by the Society and the various classes of membership.

Mr. N. E. Rowe, Technical Director of Blackburn and General Aircraft Ltd. and Past President of the Royal Aeronautical Society, was then asked to introduce the speaker. Mr. Rowe spoke of the need for a branch of the Society in this area, and recalled the growing importance of computers in almost every walk of life.

Mr. Barnard gave the meeting a frank and informative account of his experiences in installing a computer, on the lines of his recent paper in *The Computer Journal* (*Vol.* 1, *p.* 29). He began by comparing his difficulties in travelling to the meeting, from Norwich via London to Hull due to bad weather, with his approach to the installation and operation of the Norwich Computer. He said that in both cases he had chosen the longest way round, but he thought that in both cases it had been the safest and surest way.

In the first instance, a computer with an "enormous drum" had been considered, to cope with the large amount of data involved in the Norwich rate billing application. This machine, and a number of other computers which were considered, were rejected in favour of a computer using paper tape input, a magnetic drum and two magnetic film units. In the light of subsequent experience, Mr. Barnard felt that his choice had been justified and that this machine was the best and most economical for his particular application.

After describing the history of the Norwich installation, Mr. Barnard concluded with the advice that every possible control and check should be built into the program and that it is safest, at the beginning, to work along the lines of the old system rather than to endeavour to work an entirely new system with an equally new machine. He believed, however, that within the next 5 to 10 years computers would have revolutionised the ideas and methods of accountancy.

A very lively half-hour followed the talk, when Mr. Barnard had questions fired at him from the audience.

In reply to a question asking whether he could foresee the time when programmers would no longer be required, Mr. Barnard said this was unlikely to occur. He said that there is a shortage of programmers at the present time, but he felt that they would always be able to command a decent standard of living because of the quality of mind required by the job.

On being asked about the relative economies of the computer system he said that so far he had made no effort to cost the operation due to the fact that the first year had been regarded largely as an experiment. Eventually it was hoped to save about £17,000 in reduction of staff, but it would be some time before this was realised. However, he estimated that the installation would start paying for itself within the next six months or so.

Mr. P. J. Lown, on behalf of the meeting, proposed a vote of thanks to Mr. Barnard for a feast of figures and a most entertaining evening.

The meeting then agreed that a Hull and East Riding Branch of the British Computer Society Limited should be formed. The following committee was elected: Mr. P. J. Lown (Chairman), Dr. A. King (Vice-Chairman), Dr. V. W. D. Hale, Mr. E. Poulsom, Mr. E. A. Smith and Mr. J. D. Swinscoe (Honorary Secretary).

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## *Liverpool*

Some 25 members of the Society in the Liverpool district met in April to consider the formation of a local Branch. Convened by Mr. Andrew Young, of Liverpool University's Mathematics Institute, the meeting heard of the steps being taken to assess potential local membership; the Ministry of Labour, the Chamber of Commerce, many computer manufacturers and the University itself had all been invited to submit lists of those who were thought likely to be interested in the study of computers and their applications. These enquiries showed that there would be strong support for a Branch of the Society and the meeting agreed that steps towards its formation should be continued.

Plans are now being made for a public inaugural meeting in September; an interim committee is drawing up a winter programme of lectures, which will be held at the University. Study Groups will also be formed, according to the needs of members of the Branch.

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## *Manchester*

The "General Accounting" Study Group met in April to discuss their work so far and their plans for the future. Members generally felt that many of them were comparative beginners and that some study of the basic capabilities and limitations of machines would be helpful before more detailed study of application to specific problems.

It was therefore decided that for the next session this group would merge with the "Beginners" Study Group; the Branch would plan a progressive series of meetings, each led by a speaker to stimulate discussion.

# NEWS FROM MANUFACTURERS

## *The Gamma* 60

Compagnie des Machines Bull has announced a new member of its GAMMA range of computers, the GAMMA 60, of which the prototype is expected to appear during 1959. The new machine will be characterised by the division of its functions between several distinct elements. Each element has a certain degree of autonomy; it possesses its own working registers and uses its own internal program. Communication between the elements is controlled by a central unit.

The word length is variable in multiples of 24 binary digits. A single group of 24 binary digits can express 6 binary-coded decimal digits, or 4 alphanumerical characters. A magnetic core store can be provided holding from 4,096 to 32,768 such groups, with an access time of 11 microseconds.

Also included are a magnetic drum and a comprehensive range of input and output devices.

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## *Remington Rand*

Two- and three-week residential appreciation courses on the UNIVAC File Computer have been arranged by Remington Rand during the rest of this year; to be held at the Selsdon Park Hotel, Sanderstead, Surrey, the courses include practical demonstrations.

The company has also arranged a series of introductory talks on computers in commerce, in the form of one-day Seminars, in a number of provincial centres.

Details are available from the company's Univac Computer Division at 26 Kensington High Street, London, W.8.

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## Computing Equipment on Show in London

THE INSTRUMENTS, ELECTRONICS AND AUTOMATION EXHIBITION at Olympia on 16 to 25 April contained a number of exhibits of interest in the computer field.

Several firms were showing transistor packages for the construction of computing circuits. Venner Electronics Limited had a very comprehensive range suitable for frequencies up to about 50 kc/s, and Racal Engineering Limited were showing samples of the American AVCO Packaged Units which will be manufactured in this country under licence. The latter are expected to be operable at pulse frequencies exceeding one megacycle; the pulse rise times are claimed to be less than 0·15 microsecond.

The M.S.S. Recording Company demonstrated a new type of magnetic reading head invented by Dr. T. Kilburn of Manchester University and developed by the Company under contract to the Ministry of Supply. This new head is capable of reading tape at very low speeds, and even when stationary; it therefore provides a solution to the problem of recording and reading the same information at very different speeds. The dimensions of the head permit eight tracks to be recorded on $\frac{1}{2}$ in. tape, and 200 pulses per inch can be distinguished. The same Company also exhibited equipment used for the factory testing of magnetic tape for computer use. The tape is saturated with pulses and the signal obtained from each of several reading heads spaced across the tape is examined for amplitude. Tapes which pass this test are sold as specially selected tapes; there are a number of grades depending on the precise conditions and tolerances used in the test.

The Ministry of Supply had a number of items of computer interest. The model digital differential analyser developed at R.A.E. by Mr. G. C. Tootill, which had already appeared in the Physical Society Exhibition, was on show again. Paper tape readers developed at A.R.D.E., Fort Halstead, were shown in use for copying and comparing tapes, the latter at 150 characters per second. Also worth mentioning is a compact shaft digitiser developed at R.A.E., capable of signalling rotations in units of about two degrees up to 100 revolutions.

The British Tabulating Machine Company exhibited an experimental high speed serial printer operating at 160 characters per second on paper tape. The characters were made up of dots in a $5 \times 7$ matrix. Also on show was an example of printed circuits used for the back connections between plug-in units; a frame about 2 feet by 5 feet in size made up in this way was exhibited.

The purely mechanical differential analyser has not been completely ousted by electronics and a fascinating new machine was exhibited by Air Trainers Link Limited. This machine has been designed in collaboration with Professor A. Porter and Dr. J. R. Barker of Imperial College, and uses integrators of the steerable wheel type. An interesting feature of the machine is the method of making interconnections between the units, which is by means of flexible steel tape.

An item of fascinating novelty, which may be of interest to some people in the computer field, was demonstrated by Sierex Limited. This was a graphical recorder made by the Swedish firm Elema-Schönander in which the usual oscillating pen is replaced by a fine jet of writing fluid. The jet is about 2 in. long but leaves a remarkably fine trace on the recording paper, and is capable of giving a linear response up to 1,000 c/s.

The Solartron Electronic Group demonstrated some of their latest developments in analogue devices. In addition to a comprehensive range of equipment for testing servo-mechanisms, the Group showed a new range of compact analogue computing units for the construction of computers of all sizes.

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Several new items of analogue computing equipment have appeared at other exhibitions in London. The Physical Society's Annual Exhibition on 24–27 March contained a new table-top analogue computer made by Elliott Bros., and known as MINIAC. This machine contains ten drift-corrected d.c. amplifiers; the front panel is specially designed to simplify its use by students. This Company also exhibited some new printed-circuit analogue computing elements, including a d.c. amplifier and various non-linear units.

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Short Brothers have produced a time delay unit for use in analogue computers, embodying a discontinuous delay line. The input voltage is repeatedly sampled, and the sampled voltages are passed along a line of low-leakage capacitors, separated by buffer amplifiers, and stored for a short period in each of the capacitors. Twenty capacitors are used and silicon diode switches are used to transfer the charges from one capacitor to the next. The total delay is variable up to one second.

# LOOKING AHEAD

In his address to The British Computer Society on 16 June, the President, Dr. M. V. Wilkes, F.R.S., painted a stirring picture of electronic computers in the future. He scanned their many applications, from the scientific research work to which they have already contributed so much, to the problems of business and industrial management on which attention is focused today.

Great Britain has good reason to be proud of her past achievements in the computer sphere. The first two stored-program electronic digital computers in the world were built in this country, at Manchester and Cambridge. The cathode-ray tube store is known throughout the world by the name of its English inventor, and programmers of many nations acknowledge the debt they owe to the original Cambridge team. Furthermore, many of these developments were foreshadowed over a hundred years ago by the Englishman Charles Babbage.

It was perhaps inevitable that the superior productive capacity of the United States, coupled with her higher demand for mechanization, should have enabled her quickly to outstrip Great Britain in the production of large computers. However, this country clearly cannot afford to regard computers as a sideline. So many activities are beginning to depend on them that we may one day find that they have become a vital necessity.

To some extent, time is on our side. Quite apart from the invention and production of computers, there are enough difficulties in the way of applying them to individual problems to prevent our being suddenly overtaken by a dominion of computers. In the long run, however, it looks as though computers might well become a key industry which no modern nation could afford to ignore. It is, moreover, an industry for which Great Britain appears to be well equipped by her heritage. It is to be hoped that she will be able to develop it to the full.

Designing a large general-purpose computer with a range of input and output channels is a bigger undertaking than it looks, and seems to take as long as designing an aeroplane. One of the difficulties facing the designer is that, whereas an aeroplane is designed for one purpose only—to fly, a large computer may be used in dozens of different situations to do a great variety of jobs. A computer whose design begins today may not be available in a fully equipped form until 1964.

There are several computer projects proceeding at present, some being private ventures but most being supported directly or indirectly by the Government. However, there seems to be comparatively little co-ordination between them, and little attempt to assess their effect on the future development of British computer technology.

In view of the limited number of skilled designers and technicians at our disposal, perhaps the time has come when we should consider formulating a national "computer policy."

# MEMBERS' DIARY

*SEPTEMBER 1958*

17 MIDDLESBROUGH, Constantine Technical College, 7 p.m.—"Accountants, Auditors and Computers" (D. W. Hooper, National Coal Board).

22 LIVERPOOL, Arts Theatre, Liverpool University, 7.30 p.m.—Inaugural Meeting (Speaker: A. J. Barnard, City Treasurer, Norwich).

24 HULL (Leeds and District Branch), Chamber of Commerce—"The Place of a Computer in a Statistics Department" (D. H. Rees, Rothamsted Experimental Station).

24 LEICESTER, College of Technology, 7 p.m.—Branch Meeting.

*OCTOBER 1958*

1 LONDON (Business Group*), Rudolf Steiner Hall, Park Street, N.W.1, 6.15 p.m.—"Experience with the 650 Tape System" (C. W. Adams, Creole Petroleum Co.).

2 BIRMINGHAM, Electrical Engineering Dept., Birmingham University, 6.30 p.m.—"Development of Digital Computers" (Dr. M. V. Wilkes, Cambridge University Mathematical Laboratory).

6 GLASGOW, Royal College of Science and Technology—"Production Control" (J. Grant, British Tabulating Machine Co. Limited).

7 MANCHESTER, College of Science and Technology, 7 p.m.—"Programming EDSAC 1 and 2, and Developments in Automatic Coding" (Dr. D. J. Wheeler, Cambridge University Mathematical Laboratory).

7 NEWCASTLE—"Sorting and Marshalling" (R. A. Fairthorne, R.A.E., Farnborough).

8 MIDDLESBROUGH, Constantine Technical College, 7 p.m.—"Sorting and Marshalling" (R. A. Fairthorne, R.A.E., Farnborough).

9 LONDON (Scientific and Engineering Group*), Northampton College of Advanced Technology, St. John Street, E.C.1, 2.30 p.m.—"The Differential Analyser" (G. Tootill, R.A.E., Farnborough).

15 LEEDS—Meeting of Leeds and District Branch.

16 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 6.15 p.m.—"Ten Years of Computer Development" (Lord Halsbury, National Research Development Corporation).

29 LEICESTER, College of Technology, 7 p.m.—Branch Meeting.

*NOVEMBER 1958*

3 GLASGOW, Royal College of Science and Technology—Branch Meeting (Speaker: T. R. Thompson, Leo Computers Limited).

4 MANCHESTER—Meeting of Manchester and District Branch.

18 NEWCASTLE—"The Use of a Computer in Industry".

19 HULL (Leeds and District Branch), Chamber of Commerce—"How we tackled a Commercial Computer Application" (F. C. Lee).

28 LONDON, Northampton College of Advanced Technology, St. John Street, E.C.1, 2.30 p.m.—"Automatic Coding and Programming" (Dr. Grace Hopper, Remington Rand Univac, and J. Backus, I.B.M.).

*FUTURE MEETINGS*

Meetings have been announced for the following dates—

LONDON: 18 December, 19 January, 17 February, 18 March, 16 April, 12 May.
(Business Group*): 12 November
(Scientific and Engineering Group*): 9 December

BRADFORD (Leeds and District Branch): 10 December.

GLASGOW: 8 December, 9 February, 6 April.

LEICESTER: 3 December, 28 January, 25 February, 18 March.

MANCHESTER: 2 December, 6 January, 5 February, 3 March.

MIDDLESBROUGH: 21 January, 18 February, 18 March.

NEWCASTLE: 2 December, 6 January, 3 February, 17 March, 7 April.

* These meetings, while primarily of interest to members of the Specialist Groups, are open to all members.

# COMPUTER COMMENT

## *Pythagorean Problem*

American universities are finding that they have first to teach students mathematics before teaching them technology. School teaching, it is reported, is inadequate, old-fashioned, dull and pointless; students have absorbed little algebra, only a smattering of geometry and often no trigonometry. Teaching methods have advanced only imperceptibly in 200 years.

The answer to the problem, it is claimed by one education authority, is to revise the curriculum, to teach students to think mathematically from an early age, and to drop most of Euclid, to ignore logarithms on the ground that in practice people use calculating machines. Children should be encouraged to rediscover mathematical principles for themselves, to find that figures are fun.

Some extremists would go further, and reduce all mathematical subjects to a common study of abstract generalisations. Others, on the extreme right wing, so to speak, believe in concrete precision. Somewhere between the two must be the right answer. Those in this country with memories, sometimes painful, of the methods used to instruct them in elementary mathematics will have every sympathy with these researches into the best methods of mathematical training, even if the only figures they now look on as being "fun" are those constricted into the vital statistics of passing fashion.

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## *Facing the Facts*

We reported in a recent issue (Vol. 1, No. 6, p. 184) that Remington Rand Ltd. had combined their Univac Computer Division and their Organisation and Methods Services Department in a new Business Services Division. They now give as the reason for this subordination of computing to business services activity the fact that studies they had made showed that many organisations had no justifiable need for an electronic data processing installation, increased efficiency being obtained by other means.

Such frank admission is honest; to translate recognition of the facts into positive action within the company's organisation is wise and practical. The facts have been generally acknowledged for some time; too many of the smaller organisations were wasting manufacturers' time on appraisals that clearly had not the potential volume to be economic on present equipment. Future development of smaller and perhaps more limited electronic equipment, the combination of electronic and electro-mechanical business equipment, or the more ready acceptance of a time-sharing or service use of computers, may well bring these smaller organisations into more active concern with electronic computers and data-processing. Meanwhile Remington Rand's attitude is a realistic one; it certainly does not merit the headline given in one periodical's report, "Rebound from Electronic Computation," with its implication of disinterest in the subject.

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## *No Trumps?*

While an English Electric DEUCE Computer was being demonstrated at the National Physical Laboratory on 14 and 15 May, in a nearby room the ACE was taking its first simple steps. The occasion was the Annual Open Days, when hundreds of visitors, including many members of the British Computer Society, flocked to the Laboratory to see many fascinating demonstrations of the Laboratory's work.

The ACE was being demonstrated by the Control Mechanisms and Electronics Division. It is the culmination of many years' design work, of which the Laboratory's first electronic computer, the Pilot ACE, was only an intermediate stage. The ACE has words of 48 binary digits, compared with 32 in the Pilot Model, but the serial digit frequency has been increased from 1 to $1\frac{1}{2}$ megacycles per second, so that the time taken to scan one word remains unchanged. The effective speed of the machine has been increased by allowing operations to occur in consecutive word times, instead of alternate ones, and the instruction code has been changed from a $2 + 1$ to a $3 + 1$ address code. The machine is still incomplete, and at the Open Days was shown working without its multiplication and division instructions, and with only half of its mercury tank store and no drums. Nevertheless it was capable of computing $\sqrt{2}$ to 923 places, and displaying the result in decimal form by monitor.

Other work of the Division on display included a Study in Clerical Mechanisation and an experimental Learning Machine. The Clerical Mechanisation Study was a statistical analysis of data derived from a survey of family expenditure. The household accounts of 3,000 families were recorded in minute detail for two weeks, resulting in 7,000,000 decimal digits of information. These have been transcribed onto punched cards and are being analysed on the DEUCE. The results of the analysis will help to guide the preparation of the Cost of Living Index and will assist in estimating the effect of taxation changes.

The Learning Machine or 'Conditional Probability Computer' has been designed by Dr. A. M. Andrew under the direction of Dr. A. M. Uttley, the Superintendent of the Division. It examines and remembers the relationships between five binary digits. The machine was demonstrated controlling a mechanical tortoise which followed the boundaries of black and white areas painted on a table. Work is in progress on the application of these principles to industrial control.

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## *Institution of Control Engineers?*

The time has come for control engineering to be recognised as a primary technology, along with mechanical and electrical engineering. So said Sir Harold Hartley, G.C.V.O., F.R.S., delivering the Presidential Address to the Society of Instrument Technology on 20 May.

Russia has devoted great efforts to the study of control engineering as such, and Sir Harold welcomed recent signs that this country would soon be giving engineering students a training in this new branch of engineering. He looked forward to the day when suitable data processing equipment could investigate the response of industrial plant to disturbances, and so enable the system to become self-regulating. However, the key to such projects was effective instrumentation,

# COPYRIGHT IN PROGRAM MATERIAL FOR COMPUTING MACHINES

*This important statement on the law of copyright as it applies to computer programs is published for the information of members of the Society. Prepared by an eminent legal authority it deals with questions which, it is believed, have not yet been ruled upon by the Courts in this country and which therefore lie in a somewhat uncharted field of law.*

There is no doubt that copyright can exist in an original program which is committed to paper as a written or printed document in that it is a literary work within the Copyright Act, 1956.

If it is unpublished, copyright exists if the author was a "qualified person" as defined in the Act, that is to say: that in the case of an individual he was a British subject, a British protected person or a citizen of the Irish Republic or is domiciled or resident in the United Kingdom or in any country to which copyright under the Copyright Act, 1956, has been extended by treaty. In the case of a body corporate, "a qualified person" means a body incorporated under the laws of the United Kingdom or of any country to which the provisions of the Act extend.

Where the work has been published, copyright subsists if publication first took place in the United Kingdom or in any such other country as aforesaid or if the author was "a qualified person" when the work was first published or if the author had died before publication but was "a qualified person" immediately before his death.

The acts restricted by the copyright include:—

(*a*) Reproducing the work in any material form.
(*b*) Publishing the work.
(*c*) Performing the work in public.
(*d*) Making any adaptation of the work.
(*e*) In relation to any adaptation of the work, doing any of acts "(*a*), (*b*) and (*c*)."

For the present purposes, making an adaptation of the work means making a translation thereof.

In view of the fact that it is an infringement of the copyright to reproduce the work in any material form there seems no doubt that the copyright extends to punched copies of the written program on tape or cards and to a copy in any material form from a mechanically recorded program. The use of any computer using a program in this manner would presumably be an infringement of the copyright since its use would involve reproduction of the work. It also seems that performance would probably include embodying the program in a lecture.

The rights of the owner of a copyright to publish, to reproduce, and in relation to translations, run only for the original expression of thought or information in some concrete form, and not for the thought or information itself. Copyright is only infringed if the form of expression is involved, but even so it is to be noted that a second worker subsequently and independently setting out the program in the same or substantially the same form is not an infringer, for he has not availed himself of the copyright material. Copyright is not invalidated by the universal availability of the information or other basic material on which it is based: for example, copyright can exist in each of two photographs of the same scene.

The thought or information involved in a program can be set down in many different ways, and two programs which are identical in their intentions and results may appear very dissimilar. That is to say, it is generally true that a person in possession of a program in which copyright resided could avail himself freely of it without infringement and he could without great difficulty prepare from it for himself a dissimilar but equally useful version to which the original copyright would not extend. This version he could freely publish, and so on: moreover, since for the purposes of the Copyright Act the new version would be an original form of the program, there would be a new copyright in it, and, for what it might be worth, it would vest in him.

A person who undertakes to prepare a program for another to use may wish to protect his interests financially and otherwise, and it appears that this is best done by an express contract for services carefully drawn to provide the safeguards which the deviser requires. Such a contract would take copyright into account, and contain any necessary licence, but the deviser's main safeguards would derive from the contract.

In the absence of agreement the author of the work is entitled to the copyright except where it is made in the course of the author's employment under a contract of service or apprenticeship where it vests in the employer.

*

# AUTOMATIC CODING BY FORTRAN

Increasing attention is being paid to schemes which permit computers to be programmed in a manner which is easy for beginners to grasp, the actual translation to machine language being performed by the machine itself. Several such "automatic coding" schemes accept programs in a form which is based on the conventional notation of mathematics, and which is particularly appropriate for scientific work. One such scheme is described by R. A. Brooker in the first issue of *The Computer Journal*. Another is FORTRAN, which can be used with the IBM 704 (and also, in a restricted form, with the 650).

When FORTRAN is used, the programmer prepares his program in the form of "statements" which are transcribed on to punched cards and fed into the computer. Instructions already in the machine cause it to start reading the FORTRAN statements from the cards. The computer then translates these statements into machine-language instructions, recording these on to more punched cards. In this translation one FORTRAN statement gives rise to an average of 9 machine-code orders. The new set of cards can then be fed into the computer any number of times, causing it to carry out the procedure specified in the original statements.

As a simple example, consider the task of finding a root of the quadratic equation:

$$3x^2 + 1{\cdot}7x - 31{\cdot}92 = 0$$

The computer cannot be given this equation as it stands, but it can be directed to evaluate an expression for the root such as

$$\frac{-B - \sqrt{B^2 - 4AC}}{2A}$$

where

$$A = +3$$
$$B = +1{\cdot}7$$
$$C = -31{\cdot}92$$

The complete FORTRAN programme for this calculation, including the printing of the result, consists of 6 separate statements as follows:

```
A = 3
B = 1·7
C = −31·92
ROOT = [−B + SQRTF(B**2 − 4.*A*C)]/(2.*A)
PRINT 1, ROOT
STOP
```

The first statement means "assign the value 3 to the variable A". The next two statements have similar meanings. The fourth statement means "evaluate the expression on the right-hand side and assign its value to the variable called ROOT".

It will be noted that besides the ability to indicate constants (like 1·7), variables (like A or ROOT), and operations (like +, − and /), certain functions can also be used. In the above example SQRTF( ) indicates the square root of the expression in parenthesis.

To illustrate the method of programming repetitive calculations, consider the problem of forming the sum of the numbers $x_1$ $x_2$, . . . $x_{50}$. A FORTRAN program to do this is as follows:

```
      SUM  = 0·0
      DO 7 I = 1, 50
    7 SUM  = SUM + X(I)
```

The first statement sets the sum to zero initially. The second arranges that the statement numbered 7 is obeyed 50 times with I taking the values 1, 2, . . . 50 in succession. In this way $x_1$, $x_2$, . . . $x_{50}$ are added one by one to the sum.

A comparison between FORTRAN and machine-code programming is provided by a matrix inversion which was programmed by both methods. Programming time with FORTRAN was one-sixth of that with machine-code. Using an 80 × 80 matrix, the FORTRAN-produced program ran for 4 mins. 20 secs., while the other ran for 4 mins. 9 secs. The loss in speed was slight, and the speed and ease of programming were considerably greater when using FORTRAN.

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# LONDON COUNTY COUNCIL PROJECT

The London County Council recently approved proposals for the installation of an I.B.M. 650 computer at County Hall, as a result of investigations and feasibility studies carried out by officers of several departments during the past three years. The work which it is anticipated will be handled by the computer installation during the first five years of operation covers the whole of the Council's monthly and weekly payroll work, superannuation records, costing work, stores records and stock accounts. These tasks will be a prelude to longer-term objectives such as the integration of central and local accounting procedures. The equipment, which is to be hired, should be installed in 1960.

# THE ANNUAL GENERAL MEETING

The Society's President, M. V. Wilkes, F.R.S., took the chair at the first annual general meeting, held in the Great Hall of Northampton College of Advanced Technology, St. John Street, London, E.C.1, on Monday 16 June 1958. Although attendance was reduced by the London bus strike, more than 100 members were present.

Opening the meeting, Dr. Wilkes said: "Ladies and Gentlemen, may I say how pleased I am to welcome you to the first Annual General Meeting of The British Computer Society Limited. We are particularly glad to see a number of representatives from the Regional Branches.

With me on the platform are the members of Council who have been responsible for the conduct of the Society's affairs over the past year. One member, Mr. E. E. Boyles, is unfortunately unable to be present, and we have received a telegram of good wishes from him.

The Annual Report and Accounts for 1957–58 have already been circulated to all members; may I take them as read? Thank you.

I will now call on Mr. D. W. Hooper, Chairman of Council, to propose their adoption.

## *The Chairman's Address*

*The Chairman:* Mr. President, Ladies and Gentlemen: in proposing the adoption of the Society's Report and Accounts for 1957–58, I suggest that your Council can confidently claim that the Report now in your hands shows that the Society has grown remarkably quickly from infancy to something of a lusty adolescent. This growth is not only in membership but, more important, in stature and prestige.

I do not intend to take you through this report, as I feel it can stand alone as a record of considerable achievement. The importance of an Annual Report, however, often lies in what it does not say rather than in what it does say. I hasten to add that I do not imply that there has been any wilful concealment on the part of the Directors, but there are certain facets of the Society's life which cannot easily be reported on in cold print. I would like to refer to three.

Firstly, a great handicap under which your Council have conducted their efforts over the past year has been the atmosphere of uncertainty, particularly in the first few months, as to the way in which the Society would develop. Would it attract the membership that was hoped for? Were its planned activities going to be supported? Would there be the expected Regional development? On the answers to these questions depended the answer to perhaps the most important question of all, in a domestic sense; what would the Society's income be, and, consequently, what organisation could the Society afford to set up to give members the service that was envisaged?

Each advance has therefore had to be something of a step in the dark, based on intelligent anticipation and a great deal of hope. Throughout the year Council has been faced with the problem of trying to meet increasing demands of members without involving the Society in heavy expenditure which might not be recouped from expanding membership. Throughout this first year we have been, so to speak, chasing our own tail. And it says much for those members of Council intimately concerned with our finances, and for the Honorary Treasurer, that we have been able to meet expenditure out of income with a small surplus, just sufficient to be on the right side.

While noting this, we must acknowledge the great assistance received from many organisations in providing services to the Society in many ways. The National Research Development Corporation and Messrs. Turquand, Youngs & Co. are referred to in the Report. Many other organisations and companies have freely given accommodation for meetings of Study Groups and Committees, many members of Council and Committees have made use of their own office services, and many members have themselves carried out honorary work which, if translated into pounds, shillings and pence, would represent an appreciable increase on our expenditure for the year. We must also thank Dr. Tait, Principal of Northampton College, for allowing us the use of this hall.

## *A Merger of Interests*

The second significant point to which I would draw your attention is perhaps a more psychological one. The Society was formed by a marriage of two main interests, scientific and engineering on the one hand and business and commerce on the other. These two interests were, originally, carefully preserved, with equal numbers of representatives on Council with, one must admit, a certain atmosphere of suspicion, entirely mutual (*laughter*). I am sure Council Members present will forgive me for saying that the first meeting tended to be a matter of two parties facing each other across a table. We quickly adopted the "gimmick" of seating everybody alphabetically, starting on the Chairman's left irrespective of any "party allegiance." It is with very great pleasure that I can now affirm that the whole Council is one body, on Christian name terms, with a great deal of mutual respect and understanding, the old atmosphere of suspicion swept away.

This merging of interests into the one common aim, the study and development of computer techniques, has spread, too, through the Council Committees and, I am happy to record, in many of the Regional Branches which I have had the pleasure of visiting during the year. This trend is a healthy one; it is the positive answer to those who said,

during discussions on the formation of the Society, that one could never mix the two interests, that there was no common factor between the scientist, mathematician or engineer, and the accountant, statistician or secretary.

Third and last, a striking feature of the Society's progress over its first year has been the increasing acceptance of The British Computer Society as the one body of standing, representing all interests, qualified to speak nationally and internationally. The report refers to the Society's membership of the British Conference on Automation and Computation, its representation on the British Standards Institution technical sub-committees concerned with establishing common standards for data transmission media, and its participation in the organisation of the Business Symposium to be held later this year. Many other discussions are being held with other bodies, at official level, on a variety of subjects. It is too early for these to be referred to in any detail, but I will mention just two—the work which the Society is carrying out, in conjunction with some of these other bodies, on a complete list of computer installations and their applications, and a statement on the law in relation to copyright in machine programs; there are many other matters of prime importance to members and, I may add, to Great Britain. Internationally, it is heartening to see a steady rise in the number of overseas subscribers to the Society's publications, and negotiations are in progress with certain similar organisations in other countries with a view to bringing our members some additional facilities not generally available to the public.

As we enter on our second year, therefore, we start with a considerable amount of solid ground beneath us; an assured membership, which we seek to increase substantially; a happy ship so far as our organisation is concerned, with a loyal, though small, staff and a skilled crew of Council and Committee members to further the best interests of the Society; and a recognised place in national and international affairs befitting the concept and status of the Society.

## *Retirement of Chairman*

In conclusion may I add a personal note? My close association with the formation of the Society, and before that with the formation of the London Computer Group, has given me great pride and pleasure. It is always pleasing to see one's dreams coming true, and I was greatly honoured by Council electing me as their first Chairman a year ago. With the Chairmanship previously of the London Computer Group, and with my close association of earlier developments leading to that, I have had now some three years' "hard labour"; further, I feel that it is in the best interests of a young and healthy society that it should not find itself in the position of seeing the same old faces, or of being led by the same people, with the same ideas. I have therefore asked Council not to consider me for re-election as their Chairman; I have, in fact, suggested that the office should rotate periodically. I have several other good reasons: I have a most understanding employer, but I must not impose on this generosity; I would wish to devote more time to other aspects of the Society's work, particularly its publications; I have a wife who has hardly seen me at home in the evenings for some three years and, even then, the Society's work has almost crowded out the merest civilities of married life—and I must acknowledge her tremendous help as a part-time personal assistant.

I do not think that any of us, on your Council, feel that we have yet succeeded in doing everything that we hoped we would do. I am sure you will give them, under my successor, every encouragement for the future.

But let me emphasise that the Society is not Council—the Society is you, the members. Without your support, Council can do nothing, the Society cannot exist. I therefore appeal to every member to participate fully in the Society's activities, so that we may become a really informed body of opinion, a live factor in the nation's affairs.

Mr. President, I have much pleasure in moving the formal adoption of the Society's Report and Accounts for the year 1957–58. (*Applause.*)

*The President:* Before calling on a seconder for the motion, I would like to refer to Mr. Hooper's announcement that he does not wish to be considered for election as Chairman of Council for another year. I know myself, from my association with the activities of the Society, of the immense amount of work that he has done in forwarding the development of the Society to its present position, and I am sure you will all agree that we are greatly indebted to him for this work. (*Applause.*)

I now call on Captain W. J. Caskey, Royal Army Pay Corps, a member of the Manchester Branch Committee, to second the resolution.

## *Regional Interest*

*Capt. W. J. Caskey:* Before formally seconding the adoption of the Report and Accounts I would very much like to say how much value has been derived from the Society in the Manchester area. I am quite certain that this comment equally holds good in the other centres in which your Branches have been formed.

We are very proud in Manchester of being, as it were, your first outpost (even if only by a short head). It is interesting, and worthy of study, to note the growth of interest in the computer field (and therefore in our Society) throughout the provinces during the last six months.

The Manchester Branch has developed very satisfactorily. A study of the membership roll reveals the wide diversity of interest of the members. Indeed, the nature of discussions and questions raised at the meetings and study groups clearly show the great need there was for the Branch.

Certainly, from our point of view, the Society provides a common meeting-ground where problems and applications can be amplified and discussed. Further, and possibly of even more importance at this particular stage of computer development, it provides a means of education in computer techniques and a means of keeping abreast of current developments.

Therefore, I have very great pleasure in seconding the adoption of the Report and Accounts for the year 1957–58.

*The President:* I now have to put the resolution "That the Report of The British Computer Society Limited and the Accounts of the Society for the year ended 30 April 1958, as circulated to members, be adopted." Those in favour? Those against? I declare the resolution carried unanimously.

I now call on the Chairman of Council to announce the result of the election for Council and for the Specialist Group Committees for the ensuing year.

## *The New Council and Specialist Group Committees*

*The Chairman:* You will no doubt remember that three ballots were necessary for Council, for the London Regional Group member of Council, and for the Business Group Committee.

Six candidates were proposed for the four vacancies for elected members of Council, and the Scrutineer has reported the following numbers of votes reaching him on valid voting papers before 19 May:—

| | |
|---|---|
| GILL, Stanley | 518 |
| DOUGLAS, Alexander Shafto | 457 |
| MICHAELSON, Ronald Lionel | 457 |
| Boss, Thomas Bingley | 393 |
| ELLIS, Peter Vernon | 286 |
| MORRIS, Graham John | 235 |

Messrs. Gill, Douglas, Michaelson and Boss are therefore elected to Council.

For the London Regional Group Member of Council, for which there were two nominations, the Scrutineer reports the following result:—

| | |
|---|---|
| PAINE, Richard Murray | 198 |
| DAWKES, Arthur Henry | 193 |

Mr. Paine is therefore the elected London Group representative.

The effect of these elections is therefore that the following members will form the Council for 1957–58:—

A. D. Booth
T. B. Boss
E. E. Boyles
A. J. Bray
} Elected Members

M. Bridger (East Midlands)
H. G. Carpenter (West Midlands)

E. C. Clear Hill
A. S. Douglas
F. S. Ellis
H. W. G. Gearing
A. Geary
S. Gill
D. W. Hooper
} Elected Members

P. J. Lown (Yorkshire)

R. L. Michaelson
E. N. Mutch
} Elected Members

T. H. O'Beirne (Scottish)
E. S. Page (Northern)
R. M. Paine (London)
J. W. Wright (North-Western)
F. Yates (Elected Member)

and three additional members to be nominated, one each by the Scientific and Engineering Group Committee, the Business Group Committee, and the South Wales and Monmouthshire Regional Group Committee.

Membership of the two Specialist Group Committees was fixed by Council as being not less than 10 nor more than 20. For the Business Group Committee, 23 nominations were received and the Scrutineer reports the following votes cast:—

| | |
|---|---|
| Hooper, D. W. | 527 |
| Ellis, P. V. | 521 |
| Gearing, H. W. G. | 520 |
| Michaelson, R. L. | 513 |
| Geary, A. | 510 |
| Dawkes, A. H. | 503 |
| Dowse, R. G. | 498 |
| Bray, A. J. | 494 |
| Boyles, E. E. | 491 |
| Stevens, R. E. | 489 |
| Waller, A. S. | 482 |
| Park, R. H. W. | 481 |
| Hough, J. P. | 480 |
| Rotheroe, J. E. L. | 480 |
| Crawley, L. R. | 473 |
| Boss, T. B. | 459 |
| Glen, D. A. | 450 |
| England, J. L. | 443 |
| Sauvage, J. G. | 411 |
| Paine, R. M. | 410 |
| Brockbank, A. J. | 405 |
| Morris, G. J. | 358 |
| Mason, W. F. | 311 |

The first twenty of these members will therefore form the Business Group Committee.

For the Scientific and Engineering Group Committee, only 19 nominations were received and the following will therefore comprise this committee for 1958–59:—

P. G. Barnes, A. D. Booth, N. R. Bligh, H. G. Carpenter, E. C. Clear Hill, H. J. Crawley, A. S. Douglas, F. S. Ellis, A. Geary, S. Gill, E. N. Mutch, E. A. Newman, C. E. Owen, O. S. Puckle, D. H. Rees, D. Taylor, R. H. Tizard, G. C. Tootill, and J. C. Wimpenny.

*The President:* I now call on Mr. A. J. Bray, Member of Council and Honorary Secretary of the Finance and General Purposes Committee, to propose the remuneration of the Auditor.

*Mr. A. J. Bray:* I have much pleasure in proposing that the remuneration of the Auditor for the year ending 30 April 1959 should be fixed by the Council.

*Dr. F. Yates:* I have much pleasure in seconding the resolution.

*The President:* May I put that formal resolution to the meeting? Those in favour? Those against? I declare the resolution carried. Is there any other business?

*Mr. A. S. Waller:* Before you close the meeting, sir, may I propose a vote of thanks to you for your conduct of this meeting. We are all grateful to you for your interest in the Society's affairs, and for the work you are doing in promoting the Society both nationally and internationally. (*Applause.*)

*The President:* Thank you very much indeed, gentlemen. I now declare the meeting closed. Refreshments will be served in the Refectory, and I would ask you to reassemble here at 6.30.

* * *

## *Presidential Address*

After refreshments, members reassembled in the Great Hall to hear the President give his address on "The Second Decade of Computer Development." The retiring Chairman of Council, Mr. D. W. Hooper, was in the chair. The address will be published in *The Computer Journal.*

# SOCIETY AND COUNCIL NOTES

## *Chairman of Council*

Immediately following the Annual General Meeting the new Council met for the first time, the President being in the chair. After passing a unanimous vote of thanks to the retiring Chairman, Mr. D. W. Hooper, Council then elected Dr. Frank Yates as Chairman of Council for 1958–59.

## *Presentation to Secretary*

Members of Council presented Mr. W. E. Reed, the retiring Secretary, with a silver rose bowl in appreciation of his services during his term of office.

## *Regional Reception*

Before the Annual General Meeting, there was an informal gathering of more than 50 members of Regional Branch and Specialist Group Committees, with members of Council, in the Refectory of the College.

## *Council Dinner*

In the evening, members of Council entertained the President and the retiring Chairman to dinner at the Kingsley Hotel. Following the loyal toast, the President proposed "The Society," in amusing vein. The new Chairman, Dr. F. Yates, replied. The retiring Chairman, Mr. D. W. Hooper, responded to "The Guests," lightheartedly going round the table with anecdotal reminiscences of each member of Council present.

* * *

## *The Report of the Council for 1957–1958*

### FORMATION, INCORPORATION AND FIRST COUNCIL

The British Computer Society was formed by resolution as an unincorporated body on 20 May 1957 as a result of the merger of The London Computer Group and scientific and engineering interests, the assets and liabilities of the former being transferred on 1 May 1957. On 14 October 1957, The British Computer Society Limited was formed as a company limited by guarantee and not having a share capital.

As the first Council of The British Computer Society seven representatives were elected from each of the two parties to the merger, to which were added one delegate from each of the first two Specialist Group Committees of the Society.

### MEMBERSHIP

The membership of the Society steadily increased as is shown from the following figures:

| | *1 May 1957* | *31 October 1957* | *30 April 1958* |
|---|---|---|---|
| Ordinary | 445 | 720 | 1,182 |
| Associate | — | 24 | 80 |
| Institutional | 4 | 18 | 38 |
| | 449 | 762 | 1,300 |

and the rate of growth since the end of October 1957 has been largely due to the formation of our eight Regional Branches.

### REGIONAL BRANCHES

During 1957–58 Regional Branches of the Society formed at Manchester, Birmingham, Glasgow, Leeds, Newcastle, Hull, Sheffield and Cardiff.

An informal meeting of the representatives of existing and proposed Branches and some members of Council was held in Manchester on Thursday 16 January 1958, when branch administrative requirements and finances were discussed and recommendations made to Council for the development of Regional Branches and the formation of Regional Groups. The Council accepted in full the recommendations for the formation of Regional Groups and arrangements have now been made for the following Regional Groups to come into being from 1 May 1958:

| *Regional Group* | *Encompassing Regional Branches at* |
|---|---|
| Scottish | Glasgow |
| Northern | Middlesbrough and District (forming), Newcastle and District |
| Yorkshire | Hull and East Riding, Leeds and District, Sheffield and District |
| North Western | Manchester and District, Liverpool and District (forming) |
| East Midlands | Leicester and District (forming), Nottingham (forming) |
| West Midlands | Birmingham |
| South Wales and Monmouth | Cardiff and District |
| South Western | Plymouth (forming) |
| London | London |

Each of these Regional Groups has the right to nominate one Ordinary Member as a member of the Council and, nominations having been received from each of the eight Regional Groups now formed, each Regional Group will be represented on Council by an Ordinary Member from a Regional Branch within its area.

### FINANCE

The Excess of Income over Expenditure on the combined account of The British Computer Society Limited and The

British Computer Society for the year ended 30 April 1958 was as follows:

| | £ |
|---|---|
| Total Income | 4,782 |
| Less Total Expenditure | 4,673 |
| Excess of Income over Expenditure | £109 |

This was particularly satisfactory in view of the difficulties arising from the rate of growth of membership and activities. A reduced rate of subscription for 1957–58 of £2 2s. instead of £3 3s. for Ordinary Members joining between 1 January and 30 April 1958 was applied and 178 Ordinary Members joined the Society during this period.

The British Computer Society took over the accumulated fund at 1 May 1957 of The London Computer Group and The British Computer Society Limited, on its incorporation on 14 October 1957, took over the assets and liabilities of The British Computer Society. The accumulated fund of The British Computer Society Limited has been used to purchase office equipment as is shown on the Balance Sheet.

## MEETINGS IN LONDON

During the year ended 30 April 1958 twelve meetings were held in London. (*These have been reported in* The Computer Bulletin *and the full list is omitted from this reprint.*—Ed.)

## PUBLICATIONS

Plans were implemented during the year for the publication of *The Computer Bulletin*, to appear in alternate months, and *The Computer Journal*, to appear quarterly.

*The Computer Bulletin*, lithographed in its early numbers, is now being printed by letterpress and the earlier difficulties, which led to delays in publication, are now being overcome. This publication aims to provide members with items of immediate interest in the computer field, notes of the Society's activities, including those from the Regional Branches, reviews of papers, a bibliography and a correspondence column for the expression of members' views.

*The Computer Journal* made its appearance in April 1958; here it is planned to provide a permanent record of papers and articles of lasting interest to all engaged in the development and use of computing machinery and related techniques. It is hoped that *The Computer Journal* will become an important medium for recording the British contribution to the subject, but it is also planned to include important papers from workers overseas.

## OTHER ACTIVITIES

*The First British Computer Society Conference—June* 1959

Planning is well advanced for the Society's first Conference to take place from 22 to 25 June 1959 at Cambridge. Further details will be announced through the Society's publications.

*Joint Symposium on Instrumentation and Computation in Process Development and Plant Design—May*, 1959

This Symposium is being planned jointly by:

Institution of Chemical Engineers
The Society of Instrument Technology
The British Computer Society Limited

and is being held under the aegis of the British Conference on Automation and Computation. It will take place on 11 to 13 May 1959 at the Central Hall, Westminster. The Society's representative on the Joint Committee is R. H. Tizard.

*Electronic Computer Exhibition and Business Symposium* 1958

The Society is taking a stand at the Electronic Computer Exhibition, to take place at Olympia from 28 November to 4 December 1958, and has participated in arranging the Business Symposium.

## REPRESENTATION ON OTHER BODIES

*British Conference on Automation and Computation*

The Society is a Member of Group B, The British Group for Computation and Automatic Control, and is represented by E. C. Clear Hill (who is a member of the Executive Committee of this Group) and H. W. Gearing.

*British Standards Institution*

The Society has a number of individual members participating in technical Sub-Committees concerned with the establishment of standards of data transmission for punched cards, punched tape and magnetic tape.

## OFFICE ACCOMMODATION AND ADMINISTRATION

On Saturday 8 March 1958 the offices were moved to Finsbury Court, Finsbury Pavement, London, E.C.2, from 29 Bury Street, St. James's, London, S.W.1, without interruption to the Society's business, the new offices being operative on Monday 10 March 1958. As a result of the increase in office space, procedures have been introduced to reduce the time and efforts of the staff; the benefits of these procedures are beginning to make themselves felt.

## ACKNOWLEDGEMENTS

The Council wishes to record its appreciation for the temporary accommodation and other assistance provided by the National Research Development Corporation, and also for the clerical services and assistance provided by Messrs. Turquand, Youngs & Co. during the past year. The Council also wishes to record its appreciation to the many organisations which have made available facilities for the holding of Society and Committee Meetings, and to its printers, Messrs. Unwin Brothers Limited, for their advice and assistance in planning and printing the Society's publications.

## STAFF APPRECIATION

The Council wishes to record its appreciation of the invaluable work done, often at considerable personal inconvenience, by the small permanent staff who, in addition to their normal duties, have carried an immense amount of other work during the difficult period of growth and development through which the Society has passed in the last year.

On behalf of the Council,
DUDLEY W. HOOPER, *Chairman*
ANTHONY J. BRAY E. C. CLEAR HILL

23 *May* 1958

## THE BRITISH COMPUTER SOCIETY LIMITED

# BALANCE SHEET AS AT 30 APRIL 1958

| | Cost | Depreciation | Net |
|---|---|---|---|
| | £ | £ | £ |
| **Fixed Assets** | | | |
| Office Equipment at 14 October 1957 | 126 | 9 | 117 |
| *Add:* Additions | 342 | – | 342 |
| | 468 | 9 | 459 |
| *Less:* Depreciation for period | – | 17 | 17 |
| | £468 | £26 | 442 |
| **Current Assets** | | | |
| Stock of Stationery and Publications | | 397 | |
| Debtors and Prepayments | | 688 | |
| Bank and Cash Balances | | 255 | |
| | | | 1,340 |
| | | | 1,782 |
| *Less* **Current Liabilities** | | | |
| Creditors and Accrued Charges | | 915 | |
| Amounts received in advance | | 717 | |
| | | | 1,632 |
| **Net Assets Represented by the Accumulated Fund** | | | |
| Fund of The London Computer Group at 1 May 1957 | | 41 | |
| Deficiency of The British Computer Society at 13 October 1957 | | (—77) | |
| Excess of Income over Expenditure for the period from 14 October 1957 to 30 April 1958 | | 186 | |
| | | | £150 |

**Liability of Members**

*Note:* The Society has no share capital, but in terms of clause 6 of the Memorandum of Association every member undertakes to contribute a sum not exceeding £1 in the event of the Society being wound up during the time that he is a member or within one year after he ceases to be a member.

On behalf of the Council

Dudley W. Hooper, *Chairman.*

John P. Hough, *Treasurer.*

## REPORT OF THE AUDITOR TO THE MEMBERS OF THE BRITISH COMPUTER SOCIETY LIMITED

I report to the Members of The British Computer Society Limited (formerly The British Computer Society which was incorporated on 14 October 1957) that I have audited the Books and Accounts of the Society for the year ended 30 April 1958 and have obtained all the information and explanations which to the best of my knowledge and belief were necessary for the purposes of my audit.

In my opinion proper books of account have been kept by the Society so far as appears from my examination of those books.

The foregoing Balance Sheet and annexed Income and Expenditure Account are in agreement with the books of account. In my opinion and to the best of my information and according to the explanations given to me, the said Balance Sheet and Income and Expenditure Account give the information required by the Companies Act, 1948, in the manner so required, and they give in the case of the Balance Sheet a true and fair view of the state of the Society's affairs as at 30 April 1958 and in the case of the Income and Expenditure Account a true and fair view of the excess of Income over Expenditure for the year ended on that date.

London

23 *May* 1958

E. F. Milne

*Chartered Accountant*

**THE BRITISH COMPUTER SOCIETY LIMITED,
THE BRITISH COMPUTER SOCIETY,
AND THE COMBINED SOCIETIES**

# INCOME AND EXPENDITURE ACCOUNTS

| | Combined Account for the year ended 30 April 1958 | | The British Computer Society Limited from 14 October 1957 to 30 April 1958 | | The British Computer Society from 1 May 1957 to 13 October 1957 | |
|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ |
| **INCOME** | | | | | | |
| *Subscriptions—* | | | | | | |
| 1,004 Ordinary at £3 3 – .. .. | | 3,163 | | 2,274 | | 889 |
| 178 Ordinary at £2 2 – .. .. | | 374 | | 374 | | — |
| 30 Institutional at £10 10 – .. .. | | 315 | | 272 | | 43 |
| 8 Institutional at £3 3 – .. .. | | 25 | | 14 | | 11 |
| 80 Associate at £1 1 – .. .. | | 84 | | 75 | | 9 |
| 1,300 | | 3,961 | | 3,009 | | 952 |
| *Entrance Fees* 739 at £1 1 – .. .. | | 776 | | 563 | | 213 |
| | | 4,737 | | 3,572 | | 1,165 |
| *Bank Interest* .. .. .. .. .. .. | | 45 | | 31 | | 14 |
| TOTAL INCOME .. .. .. .. .. .. | | 4,782 | | 3,603 | | 1,179 |
| **EXPENDITURE** | | | | | | |
| *Administration* | | | | | | |
| Salaries and National Insurance .. .. .. | 1,676 | | 1,093 | | 583 | |
| Printing and Stationery .. .. .. .. | 627 | | 492 | | 135 | |
| Postage and Telephone .. .. .. .. | 520 | | 361 | | 159 | |
| Council and Committee Members' Expenses .. | 142 | | 126 | | 16 | |
| Other Expenses .. .. .. .. .. | 576 | | 436 | | 140 | |
| Depreciation .. .. .. .. .. .. | 23 | | 17 | | 6 | |
| | 3,564 | | 2,525 | | 1,039 | |
| *Publications*—net cost, less stock and sales | | | | | | |
| *The Journal* (1 issue) | 65 | | 65 | | — | |
| *The Bulletin* (5 issues) | 429 | | 323 | | 106 | |
| *London Activities—* | | | | | | |
| Meetings .. .. .. .. .. .. | 186 | | 109 | | 77 | |
| Study Groups .. .. .. .. .. | 82 | | 58 | | 24 | |
| *Regional Branch Activities* .. .. .. .. | 205 | | 205 | | — | |
| *Auditor's Remuneration* .. .. .. .. | 31 | | 21 | | 10 | |
| | 4,562 | | 3,306 | | 1,256 | |
| Incorporation Expenses .. .. .. .. | 111 | | 111 | | — | |
| TOTAL EXPENDITURE .. .. .. .. .. | | 4,673 | | 3,417 | | 1,256 |
| EXCESS OF INCOME OVER EXPENDITURE .. .. .. | | £109 | | £186 | | £(−77) |

# LONDON MEETINGS

## *Recording Data*

In spite of the London bus strike, there was a good attendance on Tuesday 6 May at the Northampton College for Advanced Technology to hear Dr. A. S. Douglas (Leeds University) talk on "Some Computer Techniques for the Recording of, and Reference to Data." Dr. Douglas explained that his aim in this talk was to bring together and review some of the techniques for handling data on computers. He was not proposing to make any novel suggestions at this lecture. He said that he felt it necessary in the first place to consider some of the basic notions and he spoke about a "record" as the complete unit of information which was itself composed of "labels" (by which the record and its constituent parts were identified) and the items (which were essentially the data in the record). Dr. Douglas then gave some examples of the various ways in which a record consisting of a single label and a single item could be stored inside a computer. In order not to complicate his example he assumed that he was dealing with a unified (or single level) store. He showed how the label and item could be stored in pairs of successive locations in a compact section of the store. This was equivalent to adding another label to his record—that of the store addresses of the two parts of his original record. Another way would be to store the item in a set of locations whose addresses have a one to one correspondence to the original label which had been coded for this purpose. This, in general, led to a less compact packing of the store. Yet another way would be to store according to the item, but this could lead to troubles of other types when, for example, the given class of item could be common to many distinct labels. There again problems of store allocation can arise.

He next dealt with sorting and ordering techniques and discussed the merits of four commonly used methods. Where possible he gave details on the number of comparisons required by each method and also the number of storage locations required. He concluded that the merge sort was probably the most efficient for most purposes.

Finally, he went on to deal with methods for packing information into a single store location. He gave examples of the use of markers inside the word to control sequences of operations. As a further example he showed how a marker could be used to deal with information which may require more than one store location.

* * *

## *Experience with LEO*

The bus strike was still affecting attendances at London gatherings when nearly a hundred members and guests turned up at the Caxton Hall on 19 May to hear Mr. T. R. Thompson, General Manager of Leo Computers Ltd., speak on "Four Years of Automatic Office Work."

Mr. D. W. Hooper, Chairman of Council, who was in the Chair, said that the name of Lyons, which had formerly been associated with Maison Lyons, and later with Swiss Rolls, was now strongly associated in many people's minds with the electronic office. Much of the credit for this was due to the speaker, who had played a leading part in the LEO project from the beginning.

Mr. Thompson gave a comprehensive and detailed account of the practical aspects of operating an office computer, and an article based on his talk will appear in the October issue of *The Computer Journal*. The tone of his talk was reassuring to those who feel that electronic computers may have hidden dangers for those responsible for organising office work. The supposed snags usually associated with electronic computers had not presented any serious difficulties in the case of LEO. The machine was definitely an economic proposition, although time had to be allowed for the system to get working.

Mr. Thompson stressed the importance of the thorough planning of every application, and of taking great pains in the correct design of forms. He described the great variety of jobs now being done on LEO, and said that the biggest obstacle had been the difficulty of getting a clear idea of each job at an early stage. He listed the personnel required for the LEO installation; it was important to get the right people for the job, but there had not been any serious staff problems.

Replying to questions, Mr. Thompson said that his programmers work in teams of about three, with junior assistants. The main source of economy was the replacement of clerical staff.

* * *

## *Fast Computers*

On 17 June Mr. C. Strachey of the National Research Development Corporation gave an instructive and typically entertaining talk on "Some Aspects of the Logical Design of High Speed Computers." He divided his subject into the two main topics of detailed logical

design and the overall organisation or system design. He only had time to deal with some problems of parallel adders and, of course, the associated multipliers. The main problem with parallel adders was to find ways of speeding up the propagation of "carries" across the sum. Mr. Strachey outlined some methods by which this process could be speeded up. He also showed some ways of reducing times of multiplication. He did not go into division, but he did say that it was a much harder problem.

In considering the design of systems, Mr. Strachey emphasised that the specification of such a machine was determined by considerations of the many interests involved. Since it was only possible to achieve a balance of interests in a real situation he could not deal here with a complete system. He did illustrate the power of having certain built in features which could reduce the time for a simple basic loop by more than a factor of 2.

The very fast machines envisaged would operate about 100 times faster than the fastest commercially available machine in this country. As it was unlikely that such machines would be 100 times as expensive it would appear therefore to be cheaper per operation to use the faster machines. However, there was a real need to consider operating efficiency. Thus, for example, between input of characters from a tape, such a computer could carry out a significant amount of computation on another program and return control to the input program, in time to deal with the next input character. In a similar way, several programs could be available within the computer and computation could proceed with the overall computer facilities being shared between them according to a priority system. These ideas have already been discussed by Gill in his paper on Parallel Programming. Whether time sharing can be controlled by hardware or by a Master Director program was a point much discussed.

Without a doubt this glimpse of the future machine assured many of the exciting developments that lay ahead in the computer field. Certainly the appetite of such machines suggests an expanding demand for programmers. It must also surely lead to more sophisticated machine methods of computer maintenance if the engineer's task is to be at all practicable.

## REGIONAL NEWS

Due to pressure of space, Regional News is held over to the next issue, which will include reports of Annual Branch Meetings and programmes for 1958–59.

# CORRESPONDENCE

*Letters from readers are welcomed, and should be addressed to The Editors, The Computer Bulletin, Finsbury Court, Finsbury Pavement, London, E.C.2. The name and address of the writer must be given, but will not be published if requested.*

### *The Social Revolution*

Sir,

The Editorial entitled "Twelve Years On" in the *Computer Bulletin* (Vol. 1, No. 6, page 179) suggests that the social revolution accompanying the new industrial revolution has not been recognised. This is largely true, but I would add that the skill-revolution (which is not quite the same thing as the social revolution) which accompanied the first industrial revolution has never been analysed.

In a paper at the International Congress on Automation in Paris in 1956 ("The Economic Background of Automation") I endeavoured to make a guess at the skill-revolution which has been in progress up to the stage of transfer-machine automation (or "Detroit automation") but found the available statistics extraordinarily scanty. Even since 1931, when we had a detailed census classification of industrial employment, we have difficulty because the 1951 Census changed the job classifications sufficiently to make it an extremely arduous task to try to compare the two.

I have not been able to persuade the sociologists to undertake serious study of this topic, but as far as I can guess the main trend is to eliminate manual and craft skill at one end and unskilled labour at the other. The number of semi-skilled will, I believe, continue to increase until the second, or cybernetic, industrial revolution is very far advanced. Technicians and engineers are increasing rapidly as a percentage of *their previous numbers*, but not significantly as a proportion of *the whole working population*. It could therefore be misleading to talk about the float of labour released by automation serving to introduce it.

Yours, etc.,

D. A. Bell

*Birmingham. 7 July* 1958

# UNIVERSITY COMPUTERS

## *New Equipment at Cambridge*

EDSAC 2 is gradually acquiring a new look as various bits and pieces are added to it. A Tape Reader working at up to 1,000 characters a second is attached to the machine and this has now been operating satisfactorily for some months.

A cathode-ray tube graphical output has also been developed by the Mathematical Laboratory and is working satisfactorily. This consists of two tubes, each producing the same information, one of which is a visual monitor and the other of which can have a camera placed over it. Marks are made on the face of the tube in a digital manner, spots being displayed at the corners of a grid 1,024 × 1,024. The position of each spot displayed is program controlled and they are sufficiently close together that a tolerable graphical representation can be achieved. A magnetic tape backing store is also under development and has recently been tested on the machine.

On the programming side, an interesting development has been the construction of programs to assist in working out the distribution of questions in examination papers in Part III of the Mathematical Tripos, and also to find "Impossible" candidates for the Preliminary examination in Natural Sciences for which a problem exists in allocating classroom space for practical work.

* * *

## *Manchester—Mercury and Magnetics*

The MERCURY at Manchester University, installation of which began towards the end of last year, is now in full scale operation and is already heavily booked on a 24-hour schedule. Meanwhile the Mark I is still being kept in operation although the work on it is gradually decreasing. It is expected that it will be shut down before the end of the year. In order to improve the input and output on the MERCURY, a magnetic tape input and output system is being developed using a new static reading head developed in the Electrical Engineering Department by Dr. Kilburn and associated workers. A special tape deck is being constructed and it is expected that this will be tested on the computer in the near future. A cathode-ray tube output has also been developed along lines similar to those described for the EDSAC 2.

* * *

## *Leeds Official Opening*

The official opening of the Leeds University Computing Laboratory was duly performed by Sir John Cockcroft at 10.15 a.m. on 5 July. It is anticipated that Ferranti magnetic tape equipment will soon have been supplied to the Laboratory, thus completing the installation there.

* * *

## *Southampton's Opening Ceremony*

On 30 May, Professor C. A. Coulson, F.R.S., performed the opening ceremony of the Computer Building at the University of Southampton and declared the computer functioning. The Chancellor of the University, the Duke of Wellington, presided at the ceremony.

In the course of his address, Professor Coulson said that he was very pleased to be performing the opening ceremony because he was one of a small group who persuaded responsible people in the University Grants Committee that computers were desirable in universities. Professor Coulson went on to say that there were two main reasons why universities were serving both their own and the national interest in developing computation in the way in which Southampton University was doing. The first reason was that not only do the machines expedite the business of making elaborate calculations, but also they stimulate new ideas. The second important point was that a computer can provide a liaison between industry and the University. Professor Coulson thought that in all industries, with a little wisdom and foresight, enormous improvements could be made by making use of machines of this kind.

The Director of the University Computation Laboratory, Dr. G. N. Lance, proposed a vote of thanks to Professor Coulson and explained why Professor Coulson had not been asked to name the computer itself. Dr. Lance stated that if a special name was given, a wrong impression might be created. The University wished to emphasise that *any* programmes written for *any* Pegasus would work on the University's machine.

At the conclusion of the ceremony, the building was open for inspection and the machine was used for demonstration purposes. Approximately 40 people attended, including about 20 representatives from local industrial organisations. To conclude the occasion, a lunch was held at the Royal Hotel, Southampton.

# CONFERENCES AND COURSES

## *Cybernetics*

The International Association for Cybernetics are holding their Second International Conference in Namur, Belgium, from 3 to 10 September this year. This will continue the work of the 1956 Congress, when 800 delegates attended from 22 countries.

The range of subjects to be discussed is not being limited too precisely, so that there may be the widest possible exchange of views and information. Six broad groups of subjects will be covered:

1. Information (information theory, computing machinery)
2. Automatic Machinery (the application of cybernetics to machines)
3. Automation (the use of automatic machinery in industry and office work)
4. Economic and Social Effects of Automation
5. Cybernetics and the Social Sciences
6. Cybernetics and Biology

Plenary sessions and meetings of the various sections will lead to a concluding conference at which the general results of the Congress will be summarised. Both French and English languages will be used and the proceedings will be published.

The second General Assembly of the International Association for Cybernetics will be held during the Congress; a visit to the 1958 Brussels World's Fair and other excursions will be arranged for members of the Congress and those accompanying them.

Further details may be obtained from the Conference Secretariat, 13 rue Basse-Marcelle, Namur, Belgium.

* * *

## *Analogue Computers*

The Second International Conference for Analogue Computation, organised by the International Association for Analogue Computation (AICA), is to be held in Strasbourg from 1 to 8 September 1958.

The conference will be devoted to various systems of analogue computation, to their numerous applications, and to comparisons of analogue and digital methods of electronic calculation. An exhibition of equipment will be held concurrently with the conference.

Further details may be obtained from Monsieur F. H. Raymond, Secrétaire Délégué Général de l'Association Internationale pour le Calcul Analogique, c/o S.E.A., 138 Boulevard de Verdun, Courbevoie (Seine), France.

* * *

## *Electronics and Atomics*

The Fifth International Congresses of Electronics and Atomic Energy has been held in Rome, from 16 to 30 June. The electronics section covered five main subjects, supported by some additional meetings of general interest:

1. Transistor Construction Technique (with special regard to extension of the frequency band)
2. Use of Transistors in Telecommunication Appliances and Industrial Applications
3. Colour Television
4. Techniques of Electronic Switching (in local and long distance telephone exchanges)
5. New Electronic Techniques (including nuclear application)

Other matters of more general interest discussed included electronics and the Geophysical Year, electronics as applied to guided missiles, and radioastronomy.

Further information may be obtained from Autur and Turner Group Limited, Autur House, 40 Gerrard Street, London, W.1.

* * *

## *Dundee Courses*

Dundee Technical College recently held two residential courses in June and July on electronic data processing. The first, primarily for those unfamiliar with EDP techniques, was on electronic computers and their application to business problems (23 to 27 June) while the second was for those with knowledge of EDP techniques who seek additional information and the opportunity to exchange experience and ideas. This latter course, "Developments in Electronic Data Processing," was from 30 June to 4 July.

Further information may be obtained from the Head of the Department of Management Studies, Dundee Technical College, 40 Bell Street, Dundee,

# NEWS FROM MANUFACTURERS

## *Computers in the Aircraft Industry*

A Ferranti PEGASUS Computer recently brought into service at the Brough Factory of Blackburn and General Aircraft Ltd. brings the total of computers in the British aircraft industry to 15.

The Brough machine will continue the design study of the Blackburn NA. 39 already started on PEGASUS Computers at London and Leeds. The NA. 39 has been described by Earl Mountbatten as "the world's first specially designed, low level, high speed strike aircraft." The computer will also be used on a great variety of other work for the Aircraft Design and Engine Divisions of Blackburn's.

## *Computer Users in Conference*

Evidence of the rapid growth of the British computer industry was provided when users of 17 PEGASUS Computers, which had all been installed within the last 18 months, met in London on 7 and 8 May. Mr. B. B. Swann (*Ferranti Ltd.*), said that 600 people had attended programming courses on this machine. 105 library routines had been published and about 500 more were available for interchange between users.

Mr. H. McG. Ross outlined recently developed equipment for PEGASUS, including FLEXOWRITER output, magnetic tape units (using ELECTRODATA mechanisms), air conditioned storage cabinets for the tape (offered by *Punched Card Accessories Ltd.* and *Lancashire Refrigeration Co. Ltd.*), and a converter for transcribing from Hollerith cards to magnetic tape and *vice versa* and also from magnetic tape to parallel printer. Closed circuit air cooling of the computer was available, and for handling data in analogue form there was direct analogue voltage input (developed jointly with RAE) and a chart plotter (offered by *Dobbie McInnes Ltd.*). Preliminary information was given about a number of further developments of which the prototypes were under construction (some in collaboration with *Powers-Samas*). Wherever appropriate, each development is being designed so that it may be added to any existing PEGASUS Computer, and established programs may still be used.

Among the programs described was an interesting one written by Mr. J. F. Davison (*Ferranti Ltd.*) for analysing the amount of time which the computer spent on various tasks in the execution of a program. Eleven programs had been analysed; the proportion of time spent in waiting for the drum to reach the correct position for transfer varied from 11% to 52%.

New developments on the MERCURY Computer were discussed, including magnetic tape units using a common code with PEGASUS, thus enabling the two Computers to be used in conjunction with one another. Mr. P. M. Hunt also described the PERSEUS Computer.

# PROGRAMMING FOR BUSINESS COMPUTERS: A CORRESPONDENCE COURSE

## *Business Electronics Inc., San Francisco.*

This course, which consists of 48 "assignments," is one of the best collections of teaching notes about computers in business which this reviewer has come across. It is no mere "appreciation" course, and although it is centred on the subject of programming, this is not treated as an end in itself, but as a means of appreciating the significance of computer characteristics.

The notes are attractively arranged, and the course has been carefully steered between the acres of theorising verbiage which is unfortunately only too prevalent at the present time, and bare lists of dry facts which are so easy for consultant firms to compile. There is a very useful summary of existing American machines and installations, which is made particularly valuable by giving an example of a program written for the same problem in the notation of each of the main types of computer.

Although the course is American in origin it is well worth studying in this country, and some extra material is being prepared for students here to cover English computers and usage. Some of the exercises which the student is asked to carry out may strike the reader as rather quaint and trifling; the real value of the course lies in the descriptive material. It is a pity that a subject index has not been provided for the notes, which the student will no doubt find useful for reference after the course has been completed.

S. GILL

# STUDY GROUPS 1958/1959

A note on Study Group organisation for the 1958/59 session in the last issue of *The Computer Bulletin* (Vol. 1, No. 1, page 17) stated that details of the new groups and application forms would be circulated shortly to *all* members.

As the Study Groups referred to are primarily of interest to London members, these details are only being circulated to them, and also for information to Honorary Branch Secretaries. Most Regional Branches are arranging Study Groups locally for their own members.

*Editorial*

# THE TEN-YEAR ITCH

While the computing art cannot be said to have an identifiable birthday, it is now deemed to have passed its first decade and to have entered its 'teens. In commercial application it is still immature in many respects; it suffers from many faults of adolescence: limited in outlook, unsophisticated, sometimes naïve, often brash, occasionally boastful.

And therefore what more natural than that there should be an itch on the part of those associated with computer development in business applications to tell of their growth so far; manufacturers have a worthwhile list of working installations, users have experience in operation to share with others.

Against this background we welcome the Symposium on business applications of computers, much as we dislike its official title, the "Business Computer Symposium" —for there is no such animal as a "business computer."

A study of the papers to be presented shows that some twenty applications, in diverse industries, covering every electronic digital computer currently available in the United Kingdom, will be described in some detail; at least as many again will be included in the general surveys of commercial development in the service of the Government, nationalised industries and large industrial users.

It is appropriate that, as interest in the forthcoming exhibition and symposium mounts, the Institute of Chartered Accountants in England and Wales should have issued its long-awaited views on computers in accounting applications, *Accounting by Electronic Methods*. This booklet examines the nature of EDP and its possibilities in the sphere of accounting. There is an admirable economy of phrase combined with lucidity. Such technicalities as are deemed necessary are relegated to two appendices. The approach is cautious and realistic yet one feels that a very fair assessment is achieved.

And yet the Institute's views (and, by inference, recommendations) are by no means over-conservative; indeed to many of the old school of accountants they will be surprisingly advanced. The Council of the Institute is to be congratulated on a valuable contribution to computing literature; this outline deserves the attention of the commercial and industrial world.

# MEMBERS' DIARY

*OCTOBER 1958*

1 LONDON (Business Group*), Rudolph Steiner Theatre, 33 Park Rd., N.W.1, 6.15 p.m.—"Experience with the IBM 650 Tape System," C. W. Adams (Creole Petroleum Co.).

2 BIRMINGHAM, Electrical Engineering Dept., The University, Edgbaston, 6.30 p.m.—"The Development of Computers," Dr. M. V. Wilkes (Cambridge University).

6 GLASGOW, Royal College of Science and Technology, Montrose St., 6 p.m.—"Production Control," J. Grant (British Tabulating Machine Co. Ltd.).

7 MANCHESTER, College of Science and Technology, Sackville St., 7 p.m.—"Programming EDSAC 1 and 2, and Developments in Automatic Coding," Dr. D. J. Wheeler (Cambridge University Mathematical Laboratory).

7 NEWCASTLE, University Computing Laboratory, 1 Kensington Terrace, 7 p.m.—"Sorting and Marshalling," R. A. Fairthorne (R.A.E., Farnborough).

8 MIDDLESBROUGH, Constantine Technical College, 7 p.m. —"Sorting and Marshalling," R. A. Fairthorne (R.A.E., Farnborough).

9 LONDON (Scientific and Engineering Group*), Northampton College of Advanced Technology, St. John St., E.C.1, 2.30 p.m.—"The Incremental Computer (The Digital Differential Analyser)," G. Tootill (R.A.E., Farnborough).

15 LEEDS, University Computing Laboratory, Eldon Hall, Woodhouse Lane, 6.30 p.m.—"American Experience," J. R. Eades (Production Engineering Ltd.).

16 LONDON, Northampton College of Advanced Technology, St. John St., E.C.1, 6.15 p.m.—"Ten Years of Computer Development," Rt. Hon. Earl of Halsbury (National Research Development Corporation).

22 HULL, Chamber of Commerce, Samman House, Bowlalley Lane, 7.15 p.m.—"Payroll Application," A. G. P. Morris (Stewarts & Lloyds, Ltd.).

29 LEICESTER, College of Technology and Commerce, 7 p.m.—"Installation and Maintenance of a Large Digital Computer," G. D. Royle (English Electric Ltd.).

*NOVEMBER 1958*

3 GLASGOW, Royal College of Science and Technology, Montrose St., 6 p.m.—Lecture by T. R. Thomson (Leo Computers Ltd.).

4 MANCHESTER, College of Science and Technology, Sackville St., 7 p.m.—"The Influence of High Speed Computers on Applied Statistics," S. Lipton (Rothamsted Experimental Station).

4 NEWCASTLE, University Computing Laboratory, 1 Kensington Terrace, 7 p.m.—Branch Meeting.

7 BIRMINGHAM, Electrical Engineering Dept., The University, Edgbaston, 6.30 p.m.—"The Computer and Monte Carlo Methods," W. N. Jessop (Courtaulds Ltd.).

12 LONDON (Business Group*), Shell-Mex House, Strand, W.C.2, 6.15 p.m., (*Members only—accommodation strictly limited*)—"Computer Feasibility Study," D. Field (Shell-Mex and B.P. Ltd.).

13 LEEDS, University Computing Laboratory, Eldon Hall, Woodhouse Lane, 6.30 p.m.,—"American Impressions," Panel Discussion by E. Van Ham, F. W. Allum and others.

19 HULL, Chamber of Commerce, Samman House, Bowlalley Lane, 7.15 p.m.—"How We Tackled a Commercial Computer Application," F. C. Lee (Reckitt and Sons Ltd.).

28 LONDON, Northampton College of Advanced Technology, St. John St., E.C.1, 2.30 p.m.—"Latest Developments in Automatic Coding and Programming," Dr. Grace Hopper (Remington Rand Univac Ltd.), and "Some Remarks about Automatic Programming," J. Backus (I.B.M.).

*DECEMBER 1958*

1 BIRMINGHAM, Electrical Engineering Dept., The University, Edgbaston, 6.30 p.m.—"The ACE: The Logical Construction and a History of the Project," G. G. Alway (National Physical Laboratory).

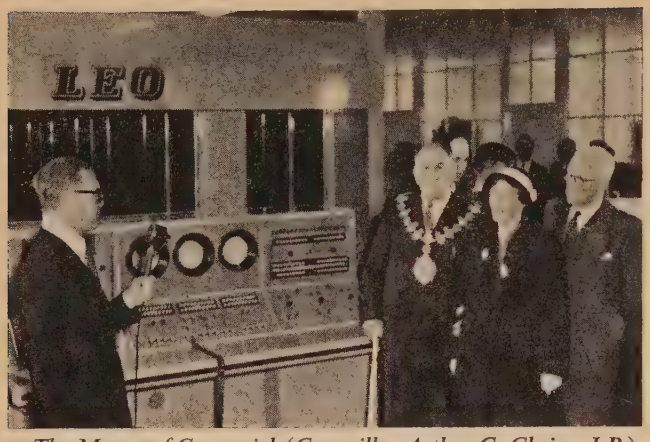
2 NEWCASTLE, University Computing Laboratory, 1 Kensington Terrace, 7 p.m.—"Computer Control of Machine Tools," A. O. Stanesby (Ferranti Ltd.).

3 LEICESTER—Branch Meeting.

4 MIDDLESBROUGH—Branch Meeting.

(*Continued on next page*)

# COMPUTER COMMENT




*The Mayor of Greenwich (Councillor Arthur C. Chrisp, J.P.), with the Mayoress and Mr. Harold Whetstone (Town Clerk), at the inaugural run of Greenwich Borough Council's payroll on* LEO. *On left is Mr. J. R. Thompson of Leo Computers Ltd.*

Greenwich Borough Council have hired time on LEO for the calculation of their payroll in order that the boroughs could gain practical knowledge of the operation of a new technique on a limited scale. The experiment has proved successful and the payroll, which previously required three hundred man hours per week, now requires but half an hour on the large computer; the cost is estimated to be reduced from £100 a week to £30. This is only a small application, of course, and Greenwich decided that an installation of the type they used would cost about £120,000 (apart from the expense of planning, housing, maintaining and operating it), which would be too costly to meet economically the needs of one borough. However, the borough authorities in south-east London (Bermondsey, Camberwell, Deptford, Greenwich, Lewisham, Southwark and Woolwich Borough Councils) are concerned with the possibility of developing a joint automatic office to undertake the total substantial load of clerical work for all contributing. A working party is now examining this possibility of shared time—if their report is favourable stimulus may be given to other groups of small or medium-sized firms to co-operate in a similar venture.

## *800 Programmers Defend a Continent*

In North America it is well known that a very long chain of early warning radar stations has been built to help in the air defence of Canada and the United States against any potential aggressor. Not so well known is the fact that a fundamental part of this defence system is a series of high-speed digital computers located throughout the United States which receive information from the radar stations. Also input is data on the flight plans of friendly aircraft, which helps the computer therefore to identify hostile aircraft and to calculate the most effective use of interceptors and missiles.

The digital computer used (the AN/FSQ-7) has been specially designed by Lincoln Laboratory and IBM. It has a magnetic core memory of about 8,400 words with an additional 100,000 words on drums. There are 5 IBM 728 magnetic tape units with an efficient buffer system. A large cathode ray tube display shows both digital information and plots of aircraft flights. Actually two complete and independent computers are part of each centre—while one is carrying out the air defence function the other operates on a standby basis, continuously receiving data, to take over whenever necessary.

One of the most fantastic points about this system is the number of programmers involved, about 800, in writing the original programs and revising them as new weapons, equipment and tactics are introduced into air defence. In the programs already written there are some 200,000 orders—surely one of the biggest computer jobs in the world.

## *Personality Parade*

We are happy to report that in a recent issue the American *Research and Engineering*, which is called the "magazine of *Datamation*," congratulates *The Computer Journal* on being the first British magazine devoted to computers and data processing.

The magazine of Datamation is a well-produced affair with readable articles and glossy pages, including a section complete with photographs on people in the computer world who have been promoted or changed their posts.

We wonder if members would like a similar service in *The Computer Bulletin*. Its success would, of course, depend on members being willing to send in information regularly to us; please let us know your views.

*MEMBERS' DIARY (December 1958—continued)*

8 GLASGOW, Royal College of Science and Technology, Montrose St., 6 p.m.—"Electronic Developments in Banking," D. S. Travers (Barclays Bank).

9 LONDON (Scientific and Engineering Group*), Northampton College of Advanced Technology, St. John St., E.C.1, 2.30 p.m.—"A Review of the N.P.L. Symposium on The Mechanisation of Thought Processes," Dr. A. M. Uttley (N.P.L.).

10 BRADFORD (Leeds and District Branch), Midland Hotel, 4.30 p.m.—"Computer Applications in the Aircraft Industry," S. H. Hollingdale (R.A.E., Farnborough).

10 HULL, Chamber of Commerce, Samman House, Bowlalley Lane, 7 p.m.—A Panel Discussion.

16 MANCHESTER, College of Science and Technology, Sackville St., 7 p.m.—"Production Control," C. M. Berners-Lee (Ferranti Ltd.).

18 LONDON, Northampton College of Advanced Technology, St. John St., E.C.1, 6.15 p.m.—"A Review of the Computer Exhibition and the Symposium on Business Applications," H. W. Gearing (The Metal Box Co. Ltd.), and D. W. Hooper (National Coal Board).

*FUTURE MEETINGS*

Meetings have been arranged in 1959 for the following dates—

LONDON: 19 January, 17 February, 18 March, 16 April, 12 May.

(Scientific and Engineering Group*): 7 January, 5 February, 2 March, 7 April, 6 May.

11–13 May: Symposium on Instrumentation and Computation in Process Development and Plant Design (jointly with the Institution of Chemical Engineers and the Society of Instrument Technology).

22–25 June: First Conference of the British Computer Society (at Cambridge).

GLASGOW: 9 February, 6 April.

HULL: 14 January, 11 February, 18 March, 15 April.

LEEDS: 13 January, 18 February (Bradford), 19 March, 14 April.

LEICESTER: 28 January, 25 February, 18 March.

MANCHESTER: 6 January, 5 February, 3 March.

MIDDLESBROUGH: 21 January, 18 February, 18 March.

NEWCASTLE: 6 January, 3 February, 3 March, 7 April.

* These meetings, while primarily for members with specialist interests, are open to all members.

# BUSINESS COMPUTER SYMPOSIUM

The suggestion that the winter of 1958–59 would be the right time for a Computer Exhibition and Business Symposium came from Lord Halsbury, as managing director of the National Research Development Corporation, early in 1957. Computers have now been operating in this country for about 10 years, at first almost entirely on scientific work but latterly on an increasing number of business applications.

With one or two exceptions, little has been published on this development. With some unfortunate examples of premature publicity in America to guide them, users in this country have been reticent and manufacturers have shown commendable restraint. But there are something over 100 machines in this country now operating, about half of them on business applications, and for those currently being installed, or already planned and ordered, business applications far outnumber those for scientific and mathematical use.

It is, therefore, a time to take stock, and to open the shop. For this is an expanding industry with a considerable potential overseas market. The exhibition, supported by nearly 40 manufacturers of computers or ancillary equipment, is under the patronage of H.R.H. the Duke of Edinburgh, and is organised by a joint committee of representatives of the Electronic Engineering Association and the Office Appliance and Business Equipment Trades Association. It is being held at Olympia, London, from 28 November to 4 December.

Concurrently with the exhibition (from 1 to 3 December), the Business Computer Symposium (in the Apex Restaurant at Olympia) will bring together several hundred users and others interested primarily in business applications. Six sessions are planned of two and a half hours, at each of which four papers will be presented. The papers will have been circulated to delegates in advance, so that the session can be devoted to a short introductory statement to each paper by the author, bringing the information up to date, followed by open discussion. The complete papers, with any necessary amendment in the light of discussion, will be published in one volume early in 1959.

The papers themselves cover a wide range, both of applications and of machines. Generally, each session contains three papers which may be termed case studies, with one of general interest. The following table (indicating the main themes of the papers only) shows the range of case studies (the numbers in the table being the reference numbers of the relative papers), while the general papers cover Government applications (15), the nationalised industries (7), a large industrial user (19), the banking world (11), industrial mathematics (22), and computer services (3).

| APPLICATION \ ASSOCIATED EQUIPMENT | B.T.M. | E.M.I. | ENG. EL. | FERRANTI | I.B.M. | LEO | NAT.-ELL. | POWERS | ST. TEL. |
|---|---|---|---|---|---|---|---|---|---|
| Earnings and Payroll .. .. | | | | | | 1 | 16 | 21 | |
| Stores Control .. .. .. | | 12 | | | | 1, 8 | | | |
| Retail Sales Invoicing, Billing and Statement Accounting | 10 | 12 | | 18 | | 1, 8 | | 6 | |
| File Maintenance .. .. .. | | | | 18 | | | 4 | | |
| Production Control .. .. .. | 2 | | 9 | | 5 | 1 | | | 17 |
| Statistical Analysis .. .. .. | | | 14 | 20 | 13 | | | | |
| General Accounting Applications .. | | 23 | | | | | | | |

The Symposium is organised by a committee of representatives of 9 manufacturers (with a member of OABETA in the chair and EEA providing the secretariat) and representatives of the National Physical Laboratory and the British Computer Society.

At the first session, on the afternoon of Monday 1 December, the opening address will be given by Lord Halsbury on "Computers: Retrospect and Prospect."

The following notes on each of the subsequent papers are given for the information of members of the Society. A brochure giving times of the sessions and fees was issued with the last number (Vol. 2, No. 2) of *The Computer Bulletin*; further information and application forms may be obtained from the Electronic Computer Exhibition offices, 11/13 Dowgate Hill, London, E.C.4.

* * *

*Some amendments to the Symposium programme have been made since the list of speakers and papers was published by the organising committee. The following synopsis has been corrected up to* 14 *September, but may still be subject to slight amendment.*

SESSION 1—*Chairman:* The Earl of Courtown (*Imperial Chemical Industries Ltd.*)

1. "Payroll and Computer Applications", N. C. Pollock, M.B.E. (*Manager, O. & M. Department, Stewarts and Lloyds Ltd.*)

This paper covers four applications of LEO to clerical and mathematical jobs in industry:

(*a*) Time and piecework earnings calculations, over 5,000 cost headings, and establishing production and cost of living bonuses. There is also a complex holiday payment scheme operated on the basis of each individual's earnings record. An interesting point is the rounding up of net pay to the nearest 10/–.
(*b*) Stock and order control over 12,000 items held in five stores, with recalculation of average prices, reports on stock levels, inter-store transfer requirements, analysis of issues by cost centre, and stock turnover analysis.
(*c*) A production control problem over the ore-digging programme, determining in which areas digging should take place each day having regard to a number of criteria, such as the suitability of different content for smelting operations, the need for keeping different faces employed, and the availability of the wagon force.
(*d*) Control of warehouse stocks of products, with invoicing of warehouse sales, central maintenance of warehouse stock records, and monthly sales statistics, trading summaries and notifications for stock replenishment.

2. "The Computer as an Aid to Production Management", J. Grant, F.S.S. (*Manager, Production Control Section, British Tabulating Machine Co. Ltd.*)

The HOLLERITH company believe in practising what they preach and describe an application within their own organisation of their production planning and control. The paper describes the nature of the problem and underlines the difficulty of determining in advance the precise requirements; this means that some degree of flexibility must be left in the production programme.

There is an interesting note on the approach to the problem, a team being established to make an assessment of the potential computer assistance that could be given, planning computer solutions where these were appropriate, and recommending organisational changes where desirable. At the date of the paper, the achievement so far falls under four main heads—

(*a*) A breakdown of the programme into a statement of purchasing and manufacturing requirements to meet the manufacturing programme, and its relationship with stock control.
(*b*) An assessment of the total plant loading, in periods by machine groups, with determination of the items to be loaded, by weekly loads and machine groups.
(*c*) Continuous progress control over manufacture.
(*d*) Stock control and its inter-relationship with (*a*) above.

The development of the project will be brought up to date when the speaker introduces the paper.

3. "Computer Services in the United Kingdom", D. Wragge-Morley (*Scientific Correspondent, Financial Times*)

Coincident with the Computer Exhibition, the *Financial Times* is bringing out a special issue reviewing the development of the computer industry in Great Britain. During the preparatory work for this special issue, Mr. Wragge-Morley has assembled a great deal of information regarding the computer services at present available to potential users. This paper reviews the present position, draws conclusions as to current trends and looks ahead into possible future developments.

SESSION 2—*Chairman:* Mr. Lewis Wright (*Chairman of the Scientific Advisory Committee of the Trades Union Congress*)

4. "Large-scale File Maintenance", D. G. Pedder, B.A. (*Radio Rentals Ltd.*)

This Company, well known for its widespread hiring of radio and television sets, has a particular problem in maintaining regular customer files over the very large numbers and wide geographical distribution involved. There is the added difficulty that rentals do not remain constant, but the rate decreases periodically, in relation to the date of commencement.

This is a NATIONAL-ELLIOTT application which started operating recently and is an interesting use of computer techniques to continuous file updating requirements.

5. "Technical Planning of Steel Tube Manufacture", R. G. Hitchcock, B.Sc., A.M.I.P.E. (*Executive Officer, Computer Steering Committee, Tube Investments Ltd.*)

There is a large number of possible combinations of dimensions and other properties of a cold drawn steel tube. It is a process industry in which details of the processes are recorded rather than the operations to make a specified tube.

This paper describes a method of employing an IBM 650 to define the method to be used to produce a tube of specific dimensions and properties, and deals with the collection of the basic information, the conversion of this data into a suitable form for computer processing, and the development and testing of the computer program. The reasons for selecting this particular computer application are discussed, with its relationship to the overall management system.

6. "Public Utility Accounting", G. Sherlock, F.A.C.C.A., A.C.I.S. (*Deputy Accountant (Mechanisation), South Western Gas Board*)

This paper deals with one important aspect of public utility accounting, the billing of a product to consumers and provision of the related statistics. In the case of industrial

consumers of gas, a considerable volume of calculation is involved, while many domestic consumers have hire purchase accounts to be taken into consideration.

This is an application of a PCC in conjunction with orthodox punched card equipment. In addition, the information already in punched card form is further used for extracting the consumption statistics necessary for planning future gas production.

7. "Electronic Data Processing in the Nationalised Industries", D. W. Hooper, M.A., A.C.A. (*Chief Organising Accountant, National Coal Board*)

This review covers current computer development in the Broadcasting, Coal, Electricity, Gas and Transport (Air, Rail and Road) industries; compiled in collaboration with representatives of those industries, the paper details the installations and applications at present in operation, those designed and programmed but awaiting delivery of equipment, and those which, after investigation, have been ordered. It also deals with many general matters of interest which affect consideration of EDP within the nationalised industries, giving facts about their size and geographical distribution, problems peculiar to certain industries, organisational difficulties, etc.

Details are also given of current investigations into many fields for EDP application, potential applications which will shortly be investigated, and possible future developments.

Other matters covered include notes on what seem to be some limitations in current equipment, the management aspect, staffing and training problems, etc. Much of the information has not been released previously, and it provides a useful survey of a section of industry with a total annual turnover of about 2¾ thousand million pounds, a payroll of more than two million men and women, and 37 million direct customers and 12 thousand million passengers annually.

SESSION 3—*Chairman:* Sir Walter Puckey (*British Institute of Management*).

8. "Inventory Control, Accounting and Payroll", A. Bradley, F.C.I.S. (*Head of Administration Department, Ford Motor Co. Ltd.*)

This is an application of LEO, on a service basis, to spare parts stores control. Some 40,000 types of motor vehicle and tractor parts are distributed throughout this country and most other parts of the world, the pattern of distribution varying from urgent demands for single items to monthly replenishment orders for several hundred orders for different parts.

Picking lists are prepared in bin order for each section of the stores, out-of-stock items being controlled by a "back-order" system. All items are priced and discounted according to quantities, individual dealers' terms, and other criteria.

Full invoice sets are produced, these having varying requirements for domestic and export customers; customers' monthly statements are also prepared. Stock control functions include, both in quantity and value, high and low stocks, consumption statistics and reports.

Development is planned on the control and payment of suppliers' accounts.

9. "Production Control by Buying Computer Time", R. B. Baggett (*Joint Managing Director, Job White and Sons Ltd.*) and G. M. Davis, M.A. (*London Computing Service, English Electric Co. Ltd.*)

This is an interesting application of production control by a DEUCE on time hire, only occupying between 1 and 2 hours of computer time each week, for a textile factory employing about 600 people.

The factory produces knitted fabric garments, of varying patterns and colours. From the customers' orders the computer assembles economic knitting batches of customer orders with reference to the various stages of manufacture, produces dyeing orders (based on minimum stock levels held) for yarns to be dyed to various colours, controls the undyed yarn stock position, computes detailed loading instructions for each knitting machine (with an extract of the knitting schedule for the knitting room supervisor), and finally produces a progress summary for following up orders.

The detailed loading instructions for the machines are optimised to reduce manual intervention on the machines to the minimum. By standardising procedures on the shop floor, individual productivity has been increased; the large amount of data processing needed could only have been performed sufficiently rapidly and accurately on a computer.

10. "Accounting for Farmers' Sugar-beet Production", J. P. Lawler, C.A. (*Chief Accountant, Comhlucht Siuicre Eireann Teo—Irish Sugar Co. Ltd.*)

A considerable amount of calculation is involved in preparing farmers' accounts so as to pay them for sugar-beet delivered to the processing plants. These calculations involve not only separate weights of washed and unwashed beet, but also such matters as sugar percentage, freight charge and subsidy, levies, and price variations according to the sugar percentage; there is also a series of control averaging calculations.

The paper describes the conditions which had to be met, and how British Tabulating Machine Co. Ltd. devised the procedure using a HOLLERITH computer as part of a system which also prepares advices to farmers and deals with payment procedure and other matters. Development is planned to other factories, and to incorporate factory costing and stores control.

11. "Electronics in Banking", Clearing Bankers Electronic Sub-Committee

It is well known that a joint Committee of banking interests in this country has been actively pursuing for some time the possibility of introducing electronic techniques into the requirements of banking, particularly in connection with the work of the Clearing House.

This paper sets out the conditions which have to be met, the line that investigations have consequently taken so far, and the stage to which current developments have progressed.

While no immediate revolution in banking techniques is heralded, much has been done with manufacturers of equipment in devising, on paper and in the laboratory, special machines for the particular type of work involved.

SESSION 4—*Chairman:* Sir John Simpson, C.B. (*Controller, H.M.S.O.*)

12. "Merchandise Accounting", D. S. Greensmith, M.B.E., A.C.I.S. (*General Office Manager, Boots Pure Drug Co. Ltd.*)

Members of the Society will remember Mr. Greensmith's address in March of this year (*The Computer Bulletin*, Vol. 2, No. 1, page 12) when he gave an interesting account of the proposed data processing system to be installed in his company and of the steps taken during the investigations which led to the selection of EMI equipment.

This paper gives much additional information and brings the story up to date, discussing many problems which arose and the means taken to overcome them.

13. "The Use of a Computer in Market Research", D. L. Rowlands (*Production Manager, A. C. Nielsen and Co. Ltd.*)

The Nielsen company have had considerable experience of computer application to market research in Switzerland. Within the past few months their United Kingdom office has successfully installed an IBM 650. The requirements of market research statistics in this country differ appreciably from those on the Continent, and this is essentially a new application. The only real link between the two installations has been the availability of the Swiss machine for program testing.

14. "Technique for Statistical Analyses of Family Expenditure", M. A. Wright, B.Sc.(Eng.), A.C.G.I. (*Control Mechanisms and Electronics Division, National Physical Laboratory*)

A case study of a particular job of statistical analysis is of interest to many business users, although this particular example (on DEUCE) was carried out by the National Physical Laboratory for H.M. Government.

The paper describes the requirements of the survey and the data available, and discusses the possible methods and systems available for doing the work. The actual system using DEUCE is then detailed, with particular emphasis on the organisation of the work of programming; this sets out to show the number of programmers which should be employed to get the programming completed in the quickest possible time.

The paper also includes details of the programs and of machine operation.

15. "Government Experience", J. H. H. Merriman, M.Sc., A.Inst.P., M.I.E.E. (*O. & M. Division, H.M. Treasury*)

This paper gives a survey of the commercial, as distinct from purely scientific, applications of computers in Government service. With much information not previously released generally, there is added detail of the responsibility for operation, current development and future possibilities.

SESSION 5—*Chairman:* Lord DeLisle and Dudley, V.C. (*President of the Office Management Association*)

16. "Installation of a Payroll Application", J. F. Body, A.C.A. (*Chief Accountant, Newton Chambers and Co. Ltd.*)

This is an account of a recent installation of a NATIONAL-ELLIOTT 405 to payroll. The application also covers certain costing and other data for management.

17. "The Application of Linear Programming to the Design of Animal Feeding Stuffs", A. Muir, M.Sc. (*J. Bibby and Sons Ltd.*)

This paper describes an application of a computer (STANTEC ZEBRA) to the control of a particular problem in a manufacturing process. The company markets a wide range of organic products, each of which is sold essentially by composition according to a precise formula. There is a large number of alternative raw materials which themselves vary in quality, availability and price from day to day. The problem is to determine the most economic mix for any given product at any given time in the light of these variable factors.

Mathematically, the situation is resolved by a large number of simultaneous linear equations with a large number of variables. On a computer, these solutions can be derived rapidly.

The paper deals with the studies made prior to the purchase of the machine, the method of application, and the economies achieved.

18. "Integrating the Procedures of an Insurance Office", K.-E. Schang (*Managing Director, A.B. Datacentralen, Sweden (for the Trygg and Fylgia Insurance Cos.)*)

This is a comprehensive application of a FERRANTI PERSEUS computer to the work of a Life Assurance office, maintaining the records, preparing information for customers, agents and managements, and compiling actuarial statements. It is based on the concept of a unified record, maintained and processed on magnetic tapes.

The paper describes the structure of the Trygg-Fylgia Insurance Companies and notes their past experience with punched card systems. It then deals with the feasibility study and considerations leading to the choice of equipment. The necessary preparatory activities for programming work, planning, and training of staff are then described, and the main programs detailed; these cover issuing, billing, accounting, file maintenance, actuarial work, and conversions from the existing systems. There is an interesting section on the experience gained from programming.

19. "The Approach to EDP of a Large User", S. G. Furniss, A.C.I.S. (*Imperial Chemical Industries Ltd.*)

A large organisation has a number of special and additional problems when considering the introduction of electronic data processing by the very nature of its size and wide geographical activity. This paper outlines how I.C.I. Ltd. approached the commercial use of computers, and underlines the commercial research aspect of their first machines.

It also includes much interesting data based on their experience to date, over a number of machines, and in various applications.

(*continued on page* 46)

# AUTOMATION AND THE OFFICE–1

*by H. W. Gearing*

*This paper was presented on 17 May 1958 at the Annual Conference of The Chartered Institute of Secretaries held at Llandudno, and is reprinted here by permission of the Secretary of the Institute. The numbers in the text refer to the references which appear on pages 45 and 46. Certain sections of the original paper have been abridged, with the Author's consent.*

## *Introduction*

At our Cardiff Conference last year, Mr. J. M. S. Risk reviewed the "Accounting Panorama"[1] and mentioned the need to see that management has at its command the most up-to-date tools, whether by way of machines or accounting statements. After dealing with the history of accountancy, accounts and training, he referred to the arrival on the scene of electronics, like, he said, the demon king in a pantomime. Whilst I have no special qualification to portray the part of this character, I will attempt, without prolonging the simile, to summarize some of the aspects of these new developments and their effects on office organization.

Two years ago, the Department of Scientific and Industrial Research published *Automation, a Report on Technical Trends*.[2] The report stated that the phenomenon was not new, its origins went back to the industrial revolution or before; it was not a single development, but a confluence of three streams of technical progress:—

(1) the development of new techniques of mechanical handling and assembling components—what I will call the mechanical engineering contribution;
(2) the development of automatic control over manufacturing processes—in other words, advances in instrument technology and feedback theory and its applications;
(3) the development of the electronic digital computer.

Later in 1956 the Board of Trade conducted an inquiry into applications of automation techniques in British industry and the results of this were published in February 1958.[3] Questions were asked about future intentions, but there was difficulty in analysing the results because the questions were not always interpreted in the same way.

It was reported by the Board of Trade that within the next few years nearly all major employers of clerical staff expected to be using digital computers: they were likely to bring increased speed and accuracy with a certain reduction in labour costs, particularly in the lesser skilled clerical jobs. It was expected that the average level of skill in the office would become higher, a new class of *programmers* would emerge and difficulties would be experienced in recruiting technicians and programmers. Only one company mentioned the need to educate the senior staff and management, which will be responsible for the work of the computer.

## *American Experience and Mr. Diebold's Brochures*

In January 1958, The British Institute of Management circulated a *flame* coloured brochure advertising a five-day course on Management for Automatic Data Processing.[4] This course was given by John Diebold and Associates, with assistance from one or two British experts. It presented material drawn from the experiences of over 1,000 computer installations in America. In June 1957, Mr. John Diebold had addressed the Eleventh International Management Congress on the dangers of too much preoccupation with equipment, the unique challenge to perform old tasks better, if approached in a new way, and the dangers of push-button thinking.[5] The first reports in the daily press of the London course made much of the fact that applications of data processing equipment to routine office procedures had not been particularly successful in the United States. In the fuller report[6] it was explained that the American machines were being given problems of a fragmented nature, and that with our better basic education we should be able in Europe to use the new machines to handle a greater number of information processing tasks simultaneously. This, however, would call for more basic training, broader in scope and more intensive than the courses available with equipment manufacturers and university extension programmes.

A few days later, those who have American friends received another version of the same brochure, this time *blue* in colour. It carried the same cover picture of four members of a study group on "Customer Accounting," but the booklet was now called *Failures in Business Data Processing . . . and How to Avoid Them*.[7] This announced a series of five-day courses to be held at seventeen American cities from coast to coast between February and June this year.

The messages of these brochures indicate that Americans have not all followed the advice of their own experts, details of which had been previously received in the annual reports of conferences of bodies such as the American Management Association[9–12] and the excellent

books by American consultants and university lecturers who had studied the application of computers to office work.[13–15] I was not altogether surprised, except to hear what people were expected to pay for the courses. At the A.M.A. Conference in New York in February 1956 at least two speakers had said that in the planning stage they appeared at conferences as *experts*, but that they ceased to be experts a few weeks after their machines were delivered. In the introduction to the report of that Conference (ref. 10, p. 5), Mr. Alfred M. Wilson, an executive vice-president of Minneapolis-Honeywell Regulator Company, said—

> "Specifically, there are four major factors that must be considered and dealt with in putting computers to work. They are:
>
> (1) the carrying out of a feasibility study;
> (2) the development and utilization of new forms of management data;
> (3) the co-existence of centralized data processing and decentralized operations;
> (4) the impact of electronization on employees."

I will refer later to these four major factors.

A year later after the A.M.A. Conference of February 1957, the editor of the report on that Conference (ref. 11, p. 5), Mr. Clifford J. Craft, said—

> "Electronic data processing has come into its own. A recent survey of U.S. firms has shown that there are already more than 600 medium-scale computers and 150 large-scale computers in operation in commercial and scientific applications. The capital investment in these installations is greater than half a billion dollars. The number of people currently associated with these existing installations is estimated to be 15,000. Clearly, E.D.P. has become an accepted tool of American management.
>
> "From all indications, the trend toward E.D.P. is an increasing one. More than 1,500 companies are seriously considering medium-scale computer installations, and over 250 companies are planning large-scale installations. In addition, one expert recently predicted that more than 170,000 trained specialists will be needed to staff the electronic installations that will be in existence by 1966."

After referring to "impressive stories of substantial savings—and equally convincing reports of increased costs," he said—

> "Aside from the savings to be realized from mechanizing clerical effort, a still relatively untapped area is improved management control through more effective reporting and improved analysis of business data."

I had seen the beginnings of this during a visit in 1956 to America; I had visited forty-three establishments in twenty towns. Eight of these were business users with computers already installed, eleven were research establishments or mathematical laboratories; I met eighteen manufacturers and six business corporations in the planning stage. The first three American computers for business data processing had been installed in the autumn of 1954, one at General Electric Company, Louisville, and two at insurance companies on the east coast. By February 1955, when the A.M.A. discussed "Electronic Data Processing in Industry," six more machines had been delivered and real office work was just beginning on about four of the nine machines. At the time of my visit (February–March 1956), I estimated from the information available that there were about fifty machines installed and intended for office work.

Those who had made the quickest progress in the application of computers to office work were those who already had significant amounts of data processing on punched card equipment: the "bugs" were already ironed out of their data and full coding systems and data editing procedures were in operation. A significant contribution to improved procedures had already been made by using punched cards, but many companies seemed to have overreached themselves in building up their vast punched card installations and in putting all kinds of jobs on to this equipment.

Among the mathematical users and university research establishments, there was ample evidence of well planned work, and a sincere appreciation of the British contribution to computer development. The level of equipment available early in 1956 in American research establishments was about equal to that available in British universities now in 1958, but at that time their scientists had less accumulated programming experience than we have now on British machines. The programs are if anything more important than the hardware.

Thus, although we are not altogether surprised by what Mr. Diebold has said, it seems that his remarks may relate to the experience of those managements which have expected much more from the new equipment than human ingenuity could possibly have given them in the time. It is the over-simplified film strips which should be partly blamed for this, and the publicity given to the pioneer efforts, for which the management consultants who work in an international sphere must themselves take some responsibility. Many machines were ordered before any programs were written, and to my knowledge there were many conscientious and able programmers who then found themselves faced with computers where the internal storage capacity was woefully inadequate for the tasks which they were expected to perform. None of the programmers to whom I spoke in 1956 were of the view that office work would be easy going and some were already in real difficulties: for example one major clerical task was to take seven computer runs instead of one.

An experienced British view is that expressed by Mr. D. T. Caminer in a recent paper to the *Journal* of the British Computer Society;[8] he says that the American experience has to some extent been repeated in this country, but on a smaller scale. . . . Other writers of recent books or papers in this country have emphasized the magnitude of the tasks awaiting those who decide to install a computer (*e.g.* [16–18]), whereas some of the earlier papers, written before any office work was done, had made it all sound much easier.[19–21]

The success or otherwise of an installation depends

partly on the efficiency of flow of detailed data from points of origin. One can be stimulated by external advice and one will undoubtedly get new ideas from watching what other people are doing. But what counts is the detailed work of the programmers and the procedures staff, which, as on any other development project, must be given reasonable freedom to experiment with alternative methods.

## *The Slow Development of Automation in the Office*

Less has been said, in management journals, of any failures to evolve complete systems in the first two streams of *automation*, as listed by D.S.I.R.[2] On the other hand, there are many papers available in the technical press to demonstrate the successful application of computers to scientific (mathematical) and statistical work: I have listed four in the references.[22–25] With the exception of LEO,[26] no one in the United Kingdom has yet had any significant degree of success in applying computers to office work.

Office automation is not really a new phenomenon, despite Mr. Risk's "demon king." It is a process of evolution which has been going on for many years. It began with things like extra carbon copies of invoices to facilitate analysis. The contribution of the electronic computer is partly in its speed, but more important is its ability to change its own program, as the computation proceeds with a calculation (the process associated with order modification), and the ability to take alternative courses dependent on the results of a particular calculation. This last *discriminating* function is, however, not new; it has existed for many years in book-keeping machines which print our bank balances in red, if we are overdrawn.

The training undergone by those who have prepared office work for conventional accounting machines or punched cards can lead up to a computer application, because even with conventional equipment data have to be edited and marshalled into convenient batches, and clear sorting or machine set-up instructions have to be observed.

In every company likely to be interested in the possibility of installing a computer there must be some accumulated experience of office automation; it may be the experience of maintaining up to date a file of address plates: even this comparatively simple operation does not just happen, it has to be organized. As we approach the era of fuller automation, we shall relearn many of the things which are such firmly accepted parts of our routines that we have forgotten them. *Full automation* implies, for the office, a process whereby basic data are converted into machine language as near as possible to their points of origin and automatically processed, if possible in an integrated single routine, to give out when required results that are significant for management attention, and to pass on to those with whom the company deals records of past transactions or instructions for future work.

I submit for your consideration seven reasons, which are responsible in varying degrees in different companies, for the slow arrival of full automation in the office:—

(1) The British equipment manufacturers, who have been pre-eminent in the development of computers for mathematical work, have not produced adequate extensions of the equipment to cater for office work. If one has wanted to get on with the office jobs, one has often had to show faith in proposals still on the drawing board.

(2) Some who ordered computers attracted much publicity before attempting any of the programming work for the major jobs. This repeats the American experience of 1954–56.

(3) Senior management has found it difficult to appraise the economics of a computer installation or to revise existing patterns of functional organization which cause the departmentalization of clerical work and duplication of records.

(4) Some office principals have been unable to appreciate what a computer will *not* do, and may have been misled by over-simplified presentations into underestimating the work of preparation for a computer. This is perhaps less true here than in America.

(5) Potential office users have failed to realize that they had something to gain from studying the experience of computers used in mathematical and statistical work, as well as the desirability of discussion with other business users, actual and potential.

(6) Means have not been available to measure in greater detail the level or the movements of basic data, required as input to the system, if better management information is to be given out.

(7) It has taken time to train staff in the new techniques, staff who know the organization from having lived with it for many years.

I will deal with these points in detail, recognizing that what I have to say may be somewhat controversial and that in this vast new subject in the office organization field there is ample room for different views. The views I express are my own and are not necessarily shared by my colleagues.

(*To be continued*)

* * *

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# BUSINESS COMPUTER SYMPOSIUM (*continued from page 42*)

SESSION 6—*Chairman:* H. J. Furness, F.C.W.A. (*President of the Institute of Cost and Works Accountants*)

20. "Analysis of Sales Statistics", C. A. Wilkes, F.C.I.S., A.C.W.A. (*Imperial Chemical Industries Ltd., Dyestuffs Division*)

This paper deals with one particular application in the organisation of I.C.I. Ltd., the analysis of sales products using a FERRANTI machine.

The paper describes the types of analyses required, and the link-up with such related operations as the production of accounting statements and financial stock control figures. This is a development of an existing punched card method, now transferred to a full electronic data processing installation with magnetic tapes.

In addition to a general description of the data processing involved, there is a more detailed write-up of several specific programs. Other matters covered include the programming effort required, practical snags of general interest and operational experience.

21. "Wages Accounting", W. H. Sargent (*Central Wages Executive, British Railways, Western Region*)

This paper covers in some detail the application of a Powers PCC to wages accounting, having regard to the particular structure of the railway organisation and the particular needs of the Swindon wages office.

After dealing with the investigation and preliminary programming, the paper includes a complete case study showing the preparation of the initial data, its transcription into punched cards and checking, the processing of the data in the computer, and the tabulation of output.

Training, both for programming and machine operation, and installation problems are described, and the economic and other benefits from the system assessed.

22. "Industrial Mathematics", D. G. Owen (*Operation Research and Cybernetics Division, United Steel Companies Ltd.*)

This paper is of particular interest to those engaged in translating business processes into mathematical concept. It has been found that a great deal of the judgment exercised by management can be expressed in simple mathematical form, and thereby made suitable for computer operation.

Many examples of these techniques are given and suggestions made of possible uses in, for example, forecasting and similar aspects of business management.

23. "Electronic Data Processing", A. J. Brockbank (*Sales Office Manager, Glaxo Laboratories Ltd.*)

This well-known manufacturing concern has many problems of management accounting procedures, in common with other similar concerns. In conjunction with EMI, a number of possible computer applications has been examined and many tested and operated.

This paper deals with some of these problems and the means used to solve them, based on practical experience.

# THE COUNCIL 1958–1959

Some of the Council Members—a group taken after the Annual General Meeting.

*Front row, left to right:* A. D. Booth, T. B. Boss, A. J. Bray, D. W. Hooper (*Retiring Chairman*), M. V. Wilkes (*President*), F. Yates (*Chairman*), M. Bridger, H. G. Carpenter, E. C. Clear Hill.

*Back row:* J. P. Hough (*Hon. Treasurer*), A. S. Douglas, H. W. Gearing, A. Geary, S. Gill, R. L. Michaelson, E. N. Mutch, R. M. Paine, R. G. Dowse (*retiring Member*), J. E. L. Rotheroe, W. E. Reed (*Secretary* 1957–58).

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[Short biographies of the 1957–58 Council members were published in an earlier issue of *The Computer Bulletin* (Vol. 1, No. 6, pp. 194–6). The following notes relate to the new members of the Council for the current year.]

BOSS, T. B.

B.A. (Oxford)
Mathematical Division, National Physical Laboratory

Following some seventeen years' actuarial work with the Royal Assurance Company at Liverpool, he joined the Royal Aircraft Establishment at Farnborough in 1944. After the war he went to the Mathematical Division of the National Physical Laboratory. With over twenty years' experience of punched card machines, he has for the past four years interested himself in the application of machines of all types, but particularly electronic digital computers, to office work.

BRIDGER, M. (*Representative of East Midlands Region*)

B.Sc.(London), A.R.C.S., A.Inst.P.
Head of Mathematics Department, Leicester College of Technology and Commerce

After reading Physics and, later, Mathematics at the Royal College of Science, he gained experience of computing at the Royal Aircraft Establishment. From 1946

he developed the work in computing at the Northampton Polytechnic. He was subsequently in charge of the PEGASUS and G-PAC installations at the Northampton College of Advanced Technology.

CARPENTER, H. G. (*Representative of West Midlands Region*)

M.A.(Cambridge), A.M.I.E.E.
Head of Computer Section, Tube Investments Technological Centre, Walsall

After reading Mechanical Sciences at Cambridge, he was at the Telecommunications Research Establishment from 1941 to 1948 working on the development of radar and other electronic devices. From 1949 to 1953 he was at the Research Laboratories of Elliott Bros. (London) Limited in charge of a Group developing digital computing systems for a number of projects. After two years with the National Research Development Corporation, again on computer work, he joined the Service Organisation of Tube Investments Limited in 1955 to organise a computer project for the application of computer techniques in the industrial activities of the company.

LOWN, P. J. (*Representative of Yorkshire Region*)

Methods Department of Reckitt & Sons Limited

In 1936 he joined the Advertising Department of his company. From 1939–46 he saw war service with the Royal Signals in the Mediterranean and the Far East.

Since the war he has had experience in various departments of the company, and formed the present department in 1952, being engaged since on O. & M. work. For the last two years he has been preparing for the installation of an electronic computer.

MICHAELSON, R. L.

F.I.A., F.I.S.
Also Fellow of the Royal Statistical Society
Assistant General Manager Elliott Brothers (London) Limited

In 1937 he qualified as a Fellow of the Institute of Actuaries, being then with the Prudential Assurance Company. From 1939 to 1945 he was in the Army at the War Office, North Africa and Italy on statistical work.

Throughout this period he was closely associated with the Army punched card installations, especially that in the Q.M.G.'s department.

On demobilisation he joined the British Tabulating Machine Company Limited and was an active member of the team which developed the HEC Computers. In 1955 he joined Decca Radar Limited and in 1957 Elliott Brothers.

He lectured in the first Northampton College courses on business applications of computers and has given many other lectures on the subject. His first contribution to computer literature was "Large-Scale Electronic Digital Computing Machines"(*Journal of the Institute of Actuaries*, 1953).

O'BEIRNE, T. H. (*Representative of Scottish Region*)

M.A.(Glasgow), F.Inst.P.
Also Fellow of the Institute of Navigation
Chief Mathematician, Barr and Stroud Ltd.

After graduating in mathematics and physics in 1938 he spent about a year as an actuarial trainee; during most of the war he was at Admiralty Compass Department, Slough. For two years he was Scientific Adviser to the Ordnance Survey, before assuming his present post in 1948. These appointments all extended his interest and experience in numerical mathematics and machine computation.

He has been secretary of the Scottish Branch of the Institute of Physics, when he organised and contributed to a lecture course in Glasgow on computers and computation.

He has recently had practical experience of several large-scale computers suitable for varied problems associated with instrument design; less seriously he hopes to help computers to play games and music, conventional and otherwise.

PAGE, E. S. (*Representative of Northern Region*)

M.A., Ph.D.(Cambridge), B.Sc.(London)
Also Fellow of the Royal Statistical Society and Member of the American Statistical Association
Director of the University Computing Laboratory, University of Durham

After obtaining a First Degree at Cambridge University, he served in the Royal Air Force as a Lecturer at the Signals Division of the Royal Air Force Technical College.

In 1949 he returned to Cambridge for research in the Statistical and Mathematical Laboratories. His interests included mathematical statistics, Monte Carlo methods and the application of computers to those fields.

In 1954 he moved to the Durham Colleges in the University of Durham as a Lecturer in Statistics and in 1956 was appointed to direct the new University Computing Laboratory at Newcastle.

He has taken part in teaching on courses on electronic computers in Cambridge, Dundee, Durham and Newcastle, and is the author of several papers and articles on his fields of interest.

PAINE, R. M. (*Representative of London Region*)

B.A.(Econ.) (Bristol)
Organisation and Methods Department, Shell Mex and B.P. Limited

After graduating in 1953 he became interested in the possibility of application of computers to business and statistical problems. His initial experience of computers and programming was gained with Ferranti Limited where he paid special attention to the problem of sorting as an important requirement of commercial data processing.

Further experience of commercial work and magnetic tape was gained with Remington Rand Limited on the

UNIVAC I at Frankfurt. With Remington he took charge of the training and programming courses.

He joined Shell Mex and B.P. Limited in October 1957, believing that real knowledge of business applications could only be obtained in depth with a user, and is now engaged in a systems study of his firm's marketing and accounting procedures.

He has lectured on several computer courses, including those held at Dundee Technical College.

WRIGHT, J. W. (*Representative of North-Western Region*)

M.A.(Cambridge)

Lecturer in Industrial Administration in the Manchester College of Science and Technology, and in the University of Manchester.

After reading Natural Science at Cambridge and Industrial Administration at Manchester he has been, successively, an Assistant Works Manager in a light engineering firm, an H.M. Inspector of Factories, a member of a leading firm of industrial consultants, and Production Manager of a pottery firm.

He has organised a number of computing courses for the Royal Army Pay Corps, and given some assistance with the overall planning of their application. At present he is preparing with Dr. Bowden a new edition of *Faster Than Thought*.

* * *

## *Council Committees*

Council have appointed the following committees for 1958–59—

FINANCE AND GENERAL PURPOSES COMMITTEE

E. E. Boyles
A. J. Bray (*Secretary*)
E. C. Clear Hill
A. S. Douglas
D. W. Hooper
J. P. Hough
T. H. O'Beirne
F. Yates (*Chairman*)

PUBLICATIONS COMMITTEE

M. Bridger
H. W. Gearing (*Secretary*)
S. Gill
D. W. Hooper
J. P. Hough
E. N. Mutch (*Chairman*)
R. M. Paine

EDITORIAL BOARD

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R. A. Brooker
E. C. Clear Hill
A. S. Douglas
R. G. Dowse
H. W. Gearing
S. Gill
D. W. Hooper
T. Kilburn
E. N. Mutch (*Secretary*)
T. H. O'Beirne
E. S. Page
R. M. Paine
F. Yates (*Chairman*)

EDUCATION COMMITTEE

M. Bridger
H. G. Carpenter
E. C. Clear Hill
P. V. Ellis
G. Foster
A. Geary (*Chairman*)
R. M. Paine

MEETINGS COMMITTEE

A. D. Booth
T. B. Boss
L. R. Crawley
A. H. Dawkes
G. Felton
G. C. Holland-Martin (*Chairman*)
R. L. Michaelson
R. M. Paine
O. S. Puckle
D. H. Rees (*Secretary*)

PUBLIC RELATIONS COMMITTEE

E. E. Boyles (*Chairman*)
A. J. Bray (*Deputy Chairman*)
*H. G. Carpenter
*L. R. Crawley
*H. C. Eady
F. S. Ellis
R. H. Tizard
G. C. Tootill
*A. S. Waller

* Co-opted Member.

1959 CONFERENCE COMMITTEE

E. C. Clear Hill
L. R. Crawley
A. S. Douglas
H. W. Gearing
E. N. Mutch (*Secretary*)
D. H. Rees
R. H. Tizard
M. V. Wilkes (*Chairman*)

BRITISH PRODUCTIVITY COUNCIL COMMITTEE

A. J. Bray
H. W. Gearing
D. W. Hooper
M. V. Wilkes

# LONDON MEETING

## *Symposium on Automatic Coding*

A very well attended meeting was held on Friday, 1 August, at The Northampton College of Advanced Technology to discuss the subject of Automatic Coding. It was a very successful afternoon with contributions from many distinguished visitors. The proceedings will be reported in full in *The Computer Journal*.

Professor J. W. Carr III of Michigan University, and Past President of the Association for Computing Machinery, gave a fine start to the symposium with his survey of American progress in automatic coding which he defined as trying to shift the burden of programming on to the machines. Messrs. R. A. Brooker, C. Robinson and A. E. Glennie also put over well their ideas in the short time available to them and stimulated many questions.

It was noticeable that the auto-code systems described were all much more useful for scientific or mathematical work than for commercial data processing. This should make those interested in commercial work think hard about whether automatic coding can be useful for such data-processing since little work on this application seems to have been carried out in the U.K.

# REGIONAL BRANCH NEWS

[*For convenience, a list of all Regional Branches is given, with the names and addresses of the Hon. Secretaries. At the date of going to press, not all Branches have commenced their* 1958–59 *activities and have no news to report. Dates of future meetings will be found in "Members' Diary."*]

## BIRMINGHAM

*Secretary:* E. C. Lavalette, 10 Cottage Lane, Marlbrook, Bromsgrove, Worcs.

## CARDIFF

*Secretary:* R. M. Thomas, 4 Park Road, Hengoed, Glamorgan.

## GLASGOW

*Secretary:* K. D. Henderson, c/o J. & P. Coats Limited, 155 St. Vincent Street, Glasgow, C.2.

## HULL

*Secretary:* J. D. Swinscoe, c/o Reckitt and Sons Limited, Hull.

## LEEDS

*Secretary:* E. W. Lunn, c/o West Yorkshire Foundries Limited, Leeds.

A meeting of the Branch was held on 20 May at which there was a panel discussion on "Financial and Administrative Considerations affecting Computer Installations," followed by the Annual General Meeting of the Branch. The panel consisted of Dr. A. S. Douglas (*Branch Chairman*), Mr. J. R. McDonald (*West Riding County Council*), Mr. F. W. Allum (*North Eastern Gas Board*), Mr. H. B. La Costa (*British Tabulating Machine Co. Ltd.*), and Mr. P. J. Lown (*Reckitt and Sons*).

The discussion began by each member of the panel describing his own association with and interest in computers. These credentials revealed the wide range of experience which was necessary to deal with the diverse and down-to-earth questions which were asked from the floor. These included such matters as the justification of a new computer installation, the staffing of an installation and the effect on existing clerical staff, administrative advantages to be expected and the time scale involved in setting up a new installation. The answers to these questions depended, naturally, on the type of organisation involved and other particular circumstances.

It seemed clear that about four years might well be the time involved between first thinking of a new installation and the final stage of getting into full production. In considering a new installation, the value of a competent working party was emphasised and, even if an outright economic justification were not possible, the computer should be regarded as an investment. In the subsequent staffing of a new installation, it was felt that commercial organisations would probably have suitable possibilities among their existing staff although a transfer might involve some internal friction. It appeared to be a common experience that younger staff were keen to embrace new ideas.

In connection with redundancy, it was felt that, with careful consideration from the start, no serious problem need arise, particularly in an organisation which had a fairly rapid turnover of clerical staff. The administrative advantages to be expected were discussed at length, particularly with respect to the possibility of centralisation. This discussion led incidentally to some good-natured exchanges when the billing habits of two of our nationalised utilities were compared. The necessity of vigorous research into the development of methods for business applications of computers as a comparatively new and stimulating study was endorsed by the panel.

## LEICESTER

*Secretary:* D. M. Collins, 88 Averil Road, Leicester.

On 14 May 1958 the Branch was formed and there were some 60 persons present. The Chairman of the meeting was M. Bridger, Head of the Mathematics Department at Leicester College of Technology and Commerce, and Dr. P. G. Wakely of English Electric gave an interesting talk, entitled "Experiences of Using a Digital Computer in Industry," on the work being done by the English Electric Company both for themselves and on a service basis to other companies buying time on the computer.

A. J. Bray of the Society's Council followed this with a talk on the development of the Society and its plans for the future.

On the afternoon of 10 July members visited the DEUCE installation at the English Electric Company, Whetstone. Dr. P. G. Wakely welcomed the party and, together with his staff, put DEUCE to work for the benefit of the visitors. The computer introduced itself by writing a description on one of its monitor screens before demonstrating its computing powers. An interesting visit pleasantly ended with tea for the visitors whilst DEUCE switched over to its normal routine.

## MANCHESTER

*Secretary:* Major H. G. A. Cordwent, College of Technology and Science, Manchester.

The Branch was formed in October 1957 and has over 100 Ordinary Members and 8 Institutional Members.

A monthly lecture meeting was held during 1957–58, with several very well-known computer personalities, including the Society's President. The lectures, which drew an average attendance of 70, were—

14 October (Inaugural Meeting)—Dr. B. V. Bowden, Principal of the Manchester College of Science and Technology.
26 November—Mr. K. F. Turner, Rolls-Royce, Ltd., Derby. "Automatic Commercial Data Processing—the first two years."
10 December—Dr. M. V. Wilkes, President, British Computer Society; Director, The University Mathematical Laboratory, Cambridge. "The Design of EDSAC II and Future Developments in Digital Computers."
14 January—Dr. S. Gill, Ferranti, Ltd., London. "Parallel Programming; a study of a new technique in digital computer programming."
25 February—Mr. A. J. Barnard, City Treasurer, Norwich. "Applications of a Computer to the work of Norwich Corporation and plans for future use."
11 March—Mr. D. W. Hooper, Chief Organising Accountant, National Coal Board. "Integrated Electronic Data Processing."

As a result of circulating all members, it was decided to

set up three Study Groups which met three times during the session:

*Accounting Applications Study Group*—The Group are examining in detail the report of the London Computer Group on General Financial Considerations; they will attempt to elaborate on this report and cover any aspects not previously covered.

*Programming Study Groups*—The Group will study Automatic Coding and its application to data processing.

*Beginners' Study Group*—The Group will examine how a feasibility study for a computer application is carried out.

The average attendance at these Groups was 12–15.

### MIDDLESBROUGH

*Secretary:* W. A. Greig, 24 Westwood Avenue, Middlesbrough.

The inaugural branch meeting, attended by over 40 people, was held on 26 June 1958. A committee was elected and at a subsequent meeting of this committee a provisional programme for the next twelve months was drawn up.

### NEWCASTLE

*Secretary:* W. F. Mason, c/o National Coal Board, Cathedral Buildings, Dean Street, Newcastle, P.O. Box 10.

The Commercial Section plan to consider the application of integrated EDP to a manufacturing company. Full details of this semi-hypothetical company have been circulated to all local members.

### SHEFFIELD

*Secretary:* D. T. B. North, 94 Brookwood Crescent, Sheffield 10.

# BOOK REVIEW

## *An Introduction to Combinatorial Analysis*

By J. Riordan, 1958 (New York: John Wiley & Sons, Inc. London: Chapman & Hall Limited).

This is a book essentially written for the mathematician and should not be attempted by those who have not attained at least to permutations and combinations at school. Indeed it leaps rapidly into deep water, and by the end of Chapter 1 has covered most of the elementary work. The statistician will find himself on familiar ground in much of Chapter 2 on Generating Functions, but may well find that by Chapter 6 on Partitions, Compositions, Trees and Networks he is no longer in quite such firm touch with the text which deals, among other things, with problems in Communications Theory. Indeed it is one of the virtues of the book that it covers a subject, elements of which appear in many different contexts, but which has not previously been treated in quite the completeness achieved here. The last two chapters dealing with Permutations with Restricted Position are particularly interesting to games theorists as well as to pure mathematicians. The mathematics becomes very sophisticated even in fairly simple problems of this kind and one is brought into touch with current research, which still has a long way to go to bring the subject to the point at which it can be usefully applied to the complex problems of business. There are copious exercises provided for the serious student, and a comprehensive bibliography at the end of each chapter. Taken altogether, a good textbook but very strong meat!

A. S. DOUGLAS

## *New Books*

The following books have been received and will be reviewed in a future issue of *The Computer Bulletin:*

NOTES ON ANALOG-DIGITAL CONVERSION TECHNIQUES, edited by Alfred K. Susskind, five contributors from the Servomechanisms Laboratory, M.I.T., published jointly by The Technology Press and John Wiley & Sons, Inc., New York (Chapman & Hall Ltd., London).

SWITCHING CIRCUITS AND LOGICAL DESIGN, by Samuel H. Caldwell, published by John Wiley & Sons, Inc., New York (Chapman & Hall Ltd., London).

# JOINT COMPUTER FOR METROPOLITAN BOROUGHS?

In the Annual Report 1957–58 of the Organisation and Methods Committee of the Metropolitan Boroughs some interesting comments are made on the use of electronic computers and the possibility of the joint use of a machine by several boroughs. It is very heartening to see local authorities taking such a keen and knowledgeable interest in electronic data-processing equipment.

The report contains some sound observations on computer investigations—"a very great amount of planning work (to be reckoned in terms of man-years for a large organisation) is essential before a computer is used. Unless this is done effectively and fully, there is great danger either that a costly piece of equipment will not be used at all or will do moderately a task already well carried out by traditional methods" . . . "to make full use of its facilities the total clerical and accounting activities of the Council should be envisaged as a whole."

A penetrating, if still controversial comment, is the statement that "greater benefit was available from a shorter period of time on a comprehensive computer (i.e. one capable of carrying out a fully integrated procedure) than from having a much longer time on a small and limited machine." If this is true it tends to follow that small firms cannot reap the full benefits of computers from a small machine, and therefore it may be better for them to join together to share a larger machine.

# NEWS FROM MANUFACTURERS

## *IBM 7070 Data-Processing System*

IBM have announced a new data-processing system 7070 (SEVEN-O-SEVENTY) which operates at very high speed, is fully transistorised, has a large core store and offers many new facilities. It is a flexible data-processing system capable of expansion to meet the needs of the medium and large-scale commercial user. The 7070 in size may be said to come between the 650 and the 700 series.

The system can be made up from a selection of the following units:—

1 Console
1 Central Processing Unit—5,000 or 10,000 words on magnetic cores
1–3 Card readers—400 c.p.m.
1–3 Card punches—250 c.p.m.
0–3 Printers—150 lines p.m. (120 characters)
0–12 Magnetic tape units—either
729 model II—15,000 c.p. second, or
729 model IV—62,500 c.p. second
0–4 RAMAC Units (6 million decimal digits each)
0–10 Enquiry Typewriters.

As usual with IBM computers great attention is paid to the validity checking of data which is being input, output or transferred—this is very important with so many units making up the system. Access time to the core store is 6 micro-seconds and transfers are parallel by word. Special techniques are available for the fast up-dating of low activity files on magnetic tape by high-speed block skipping. Multi-action high-speed activity is obtained in the system by the ability to perform simultaneous card reading, card punching, printing, tape or RAMAC reading and writing while processing is being carried out by the central unit.

This 7070 equipment, which is to be marketed throughout the world, will be manufactured in the U.S.A. If the order book demands it production may be started in time in Europe. The purchase price of such a flexible system can vary widely from just over £200,000 to just under £1,000,000, with corresponding rentals. The company hope to obtain an order in this country shortly.

## *Atomic Energy Applications*

Ferranti's MERCURY computer certainly seems to have captured the computer market for atomic energy and nuclear engineering applications. They have announced that the Belgian Atomic Energy Authority are the latest to order MERCURY—this represents the seventh European atomic centre to decide on this computer. The other atomic centres to order are Geneva, Paris, Oslo, Stockholm, and the United Kingdom establishments at Harwell and Risley—this adds up to a very fine performance by a British manufacturer.

It is claimed by Ferranti that MERCURY is the most advanced computer in scope and speed manufactured in Western Europe. The machine can undertake large-scale research work which could previously only be done by a few very large computers in the United States. The purchase price of about £100,000 is stated to be almost the same as one year's hire of a large computer in the United States.

## *Punched Card Merger*

No comment from the firms concerned is yet available concerning the agreement in principle for a merger between British Tabulating Machine Company Limited and Powers-Samas Accounting Machines Limited. This merger, if it is approved by the shareholders, will certainly be of great interest to many members of the Society. Its full effect will probably not be felt for some years, but its main advantage should be the avoidance of overlapping in research and development projects.

If it leads to standardisation of punched cards, as is also envisaged in the current British Standards Institution investigation, it certainly will be of considerable benefit to potential punched card and computer users. It may also, of course, reduce the choice of punched card equipment to two manufacturers instead of three, which in itself may be of assistance to firms trying to choose equipment.

## *Computer Literature*

It is time that praise was given to Ferranti Limited for their constant stream of literature on computer applications, programming techniques and additions to their library of sub-routines. This must be one of the most prolific productions of documents of any manufacturer in the United Kingdom, and does not consist of the usual sales "glossy" but mainly of duplicated sheets which bring information quickly to the potential or existing user. Recent leaflets have varied from a program for production scheduling and a log-book analysis of the use of computer time to the determination of maxima and minima of a solution of differential equations. Other manufacturers might well copy instead of producing advertising brochures of "push-button" over-simplified computer systems seemingly operated by glamorous models.

## *Staff Savings with Leo II*

Most readers will probably already know that the Ministry of Pensions and National Insurance have ordered a LEO II for their Newcastle offices to perform payroll and statistical duties. The Ministry obviously placed great importance on the experience gained by Lyons in data processing applications and in the reliability of their equipment. Many computer commentators these days make a point of stating that computers normally do not save staff. But it is reported that the LEO II for the Ministry will displace 100 staff engaged on clerical and machine processes who will be absorbed in other vacancies caused by normal wastage. It is unlikely that 100 staff will be required to plan and operate LEO II so here for once there seems to be an actual saving of staff.

*The next issue of* The Computer Bulletin, *to be published at the end of November, will contain a report on some of the more significant and new items of equipment to be shown at The Computer Exhibition.*

*Editorial*

# FATHER THAMES NEEDS HIS TRIBUTARIES

Our appetites have been sharpened by the fare displayed in Members' Diary. When does the feast begin?

A trickle of articles is now coming in from the Branches, but every Branch should have some item of interest to the computing world in every issue of the Bulletin. It is a poor Branch that cannot produce an account of some activity once in two months.

The Branch Secretary, or the "Rapporteur" in the case of the larger Branch, is the man on whom we depend, not only for advance notice and reports of meetings, but also for details of computing courses. Fortunately most of our Branches have a link with the local Universities and Technical Colleges, and information sent in is duly collated by our Education Committee.

But energetic members of rapidly expanding Societies do not need to route everything through Branch officers. We welcome your direct approach by letter.

In other Societies Branch membership is a category distinct from Society membership. Would this be of benefit to our Society as a whole and to the Branches individually?

Every computer installation adds to the number of programmers and coders. There is no national recognised qualification in programming as such, and yet who would deny the art, the craft and scientific knowledge required for the task? The British Computer Society is not an Examining Body but can hardly fail to have a keen interest in the growth of a new body of professional workers.

Let us have your views. Let the rivers of ink flow!

# COMPUTER COMMENT

## *Sic Transit . . .*

In Memoriam

EDSAC 1

Obiit Superfluitate

Numerorum Primorum

R.I.P.

6 May 1949 – 5 July 1958

(*Notice posted in the Cambridge University Mathematical Laboratory on the occasion of the removal of the power pack from* EDSAC 1 *for use on* EDSAC 2)

* * *

## *Think!*

"On the wall over the Burtonwood . . . (IBM machines) . . . there is a notice which bears the single word: COGITATE." (*Yorkshire Evening Post, 1 September 1958.*)

* * *

## *Much Simpler That Way*

"At one farm at Elmley Castle seventeen ewes which lambed in January have just produced $2^6$ lambs." (*Manchester Guardian, 19 September 1958.*)

* * *

## *Cheshire County Council*

The first IBM 650 computer to be used in local government was installed in the County Treasurer's Department at County Hall, Chester, in May of this year. Already it is handling a complete data processing system for the payment, recording and costing of salaries and wages of some 4,000 employees, which it is intended to expand to the full establishment of 18,000 employees. In addition, up-to-date stores, costing and accounting information covering the whole of the roads and bridges maintained by the County Council is now being produced by the computer and ancillary punched card equipment. Other work of the County Council covering a variety of clerical routines is scheduled for investigation with a view to computer application.

* * *

## *We Hear That . . .*

Direct input of spectro-photometer readings of the proportion of each "rainbow" band of colour in a batch of material enables technical descriptions of colour shades to be expressed in mathematical form by computer for positive matching; the system has been devised by the National Bureau of Standards.

A computer costing about one-tenth the price of a "conventional" computer has been developed in Japan; the machine is said to use "parametrons" in place of conventional valves.

The American computer industry is recovering from the recession, with *Remington, Burroughs* and *Royal-McBee* all reporting increased sales and orders for 1958 over 1957; *IBM*, on the other hand, state that sales in the first five

months of 1958 are substantially lower than for the same period in 1957.

Dutch airlines' 22,000 flight plans over 140 routes are now pre-calculated by computer; work previously taking several months is now done in ten hours.

Diagnosis by computer, from information as to the patient's symptoms and laboratory findings, has been described to a medical conference in Paris; the *British Medical Journal* reports that it is only one step to the computer prescribing the best treatment from its stored experience.

A recent *Pravda* article reviewed current Russian development in the computing field; with not enough machines available for potential users, the problem "of further developing calculating centres and transforming them into a single State system is a very urgent one."

Experiments in patent examination by computer have been carried out by the U.S. Patent Office on searches for chemical structures; by giving each atom in a structural diagram a serial number and comparing structures, the obvious mismatches can be rejected quickly and the search thus narrowed.

* * *

## 1—2—*X*

"After years of research, after countless trials and exhaustive tests, the Daily Mail Electronic Brain goes into action for the 1958–59 pools season. This brain takes into account twenty different key factors that can affect the result of any given game. . . . Don't miss this revolutionary start to the season." (*Daily Mail, 19 August 1958.*)

* * *

## *Electronic Error*

A County Council's computer issued an authority for a payment by cheque, which was duly signed and issued, in favour of a creditor for the reciprocal of an amount which was in fact due to the Council, an error which could have cost the Council nearly £100,000, but for the honesty of the recipient.

* * *

## *Platonic Error*

Client of an Introduction Service in America which selects soul-mates by computer was surprised when all contacts made through the service were septuagenarians; her age of 27 had been input as 72.

* * *

## *On the Right Track*

The use by British Transport Commission of an analogue computer to aid the preparation of railway timetables has been widely reported. Not so well known is the fact that the computer was developed and built, perhaps hardly surprisingly, under the direction of Professor E. Bradshaw.

* * *

## *English As She Is Spoke*

The United States Air Force has announced the development, jointly with the *Remington-Rand Division of Sperry-Rand Corporation*, of AIMACO (Air Material Command Automatic Compiler). The machine reacts to the spoken word and at present recognises 30 English verbs. The dialectal preference of the machine is not reported.

* * *

## '*Core*' *Blimey*

With Bulletin
To *drum* it in,
A *bit* from you
(A *word* or two)
Yields *blocks* of news
And *reels* of views.

# CORRESPONDENCE

*Letters from readers are welcomed, and should be addressed to The Editors, The Computer Bulletin, Finsbury Court, Finsbury Pavement, London, E.C.2. The name and address of the writer must be given, but will not be published if requested. Pressure on space compels us to request that correspondence should be brief and to the point.*

## *Programming By Correspondence*

Sir,

We are very grateful to Dr. S. Gill for his notes on our correspondence course "Programming for Business Computers," which you published in your August/September edition.

However, we do not agree that the exercises which the student is asked to carry out can be written off as "rather quaint and trifling." Naturally, opinions will always differ on teaching methods and the type of subject to which programming belongs, half theoretical and half practical, will be particularly controversial in this respect. The point we wish to make is that each exercise is to be done at an intermediate stage of the student's education, and must be judged in this light. By doing the exercises the student is preparing himself little by little for the job which awaits him at the culmination of his studies.

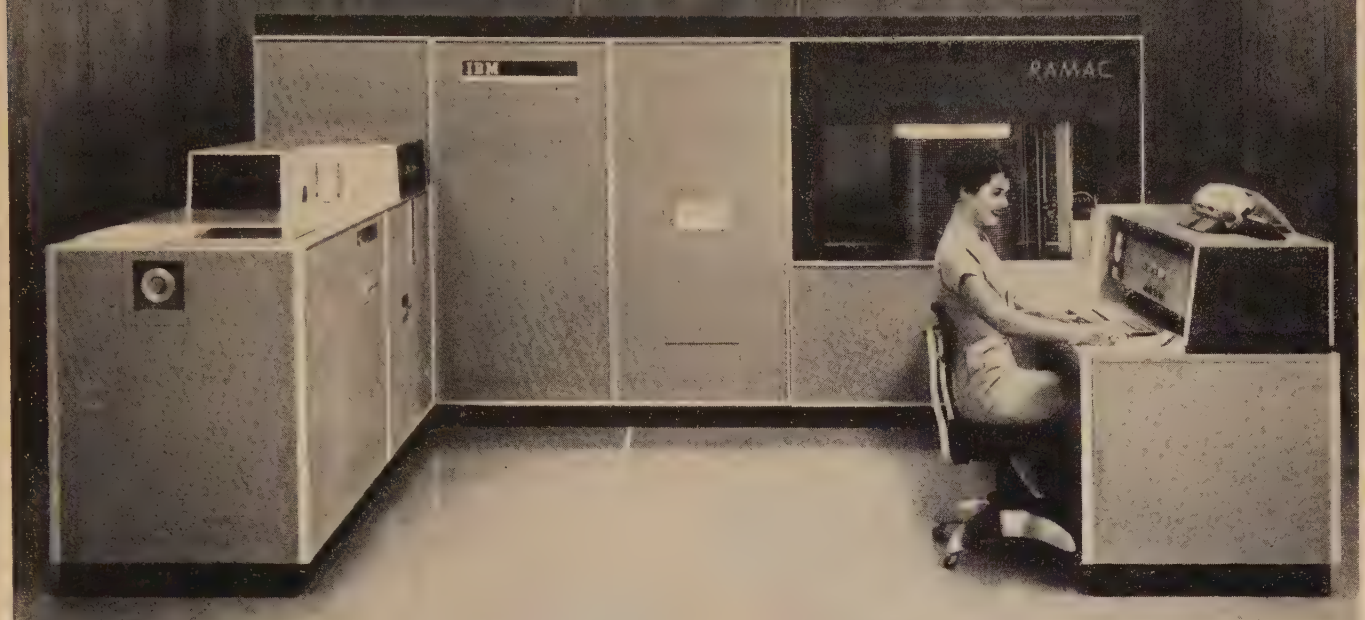
With regard to the subject index, we should like to point out that there is a detailed table of contents at the beginning of the course text which should suffice for reference after the course has been completed.

Yours, etc.,

*119 Oxford Street, W.1.*
*23 September 1958*

KENNETH S. MOST
*for Computer Courses*

# THE ELECTRONIC COMPUTER EXHIBITION




*A Preview—by our Special Correspondent*

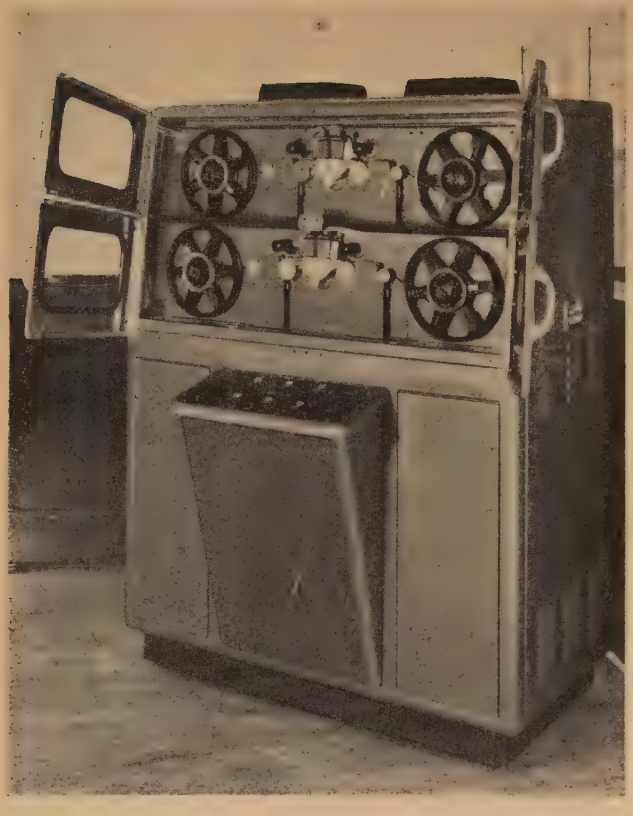
The "Ten Year Itch" referred to in the editorial of our previous issue (Vol. 2, No. 3) is evident in the interesting and stimulating display of computers and ancillary equipment promised for the Electronic Computer Exhibition at Olympia from 28 November to 4 December. The manufacturers are obviously proud of their achievements and are itching to show what they have done and what they plan to do. From information released it seems certain that the exhibits will show a blend of machines already handling bread-and-butter office or technical work, and of experimental models and hopes for the future.

For several years at various exhibitions, either for businessmen or scientists, we have encountered, after wearily walking many feet of floor space, an odd computer or two and even occasionally one working. Now the computer industry has grown up and is worthy of its own exhibition. Members would do well to visit Olympia and take advantage of this vast gathering of analogue and digital computers and the various allied pieces of equipment—cards, paper tape, printers, carbon feeds and so on. It will be several years before we will again have the chance to see so much electronic hardware and confident dreams arranged in one building.

What is likely to be significant and catch the eye at this exhibition? Our attention is always gripped by the quality of newness or by equipment on display for the first time in this country—and there are several developments which come up to this test.

Though well publicised for some time and hard at work in Europe at the Brussels Exhibition, the **International Business Machines** 305 RAMAC is on show for the first time in Britain (*illustrated above*). This is of course a machine developed to meet the need in business for the storage of large files with the requirement of speedy random access to them, but without so much emphasis being placed on a fast arithmetic unit. The 305 can have one or two disc storage units each holding 5 million characters, and the information stored on these discs will be used during the six days of the Exhibition to produce such reports as invoices, stock receipts and statements.

Another interesting machine is the IBM DATA TRANSCEIVER equipment used for direct transmission of information from punched cards to punched cards by telegraph, telephone lines or wireless. This equipment should be useful to firms who have the problem of sending data from branch offices or factories to a central



*Decca Twin Tape Unit*

processing unit. It is claimed that 8½ cards per minute can be transmitted by one machine over a telephone circuit. The G.P.O. is giving assistance to extend the use of the TRANSCEIVER in this country.

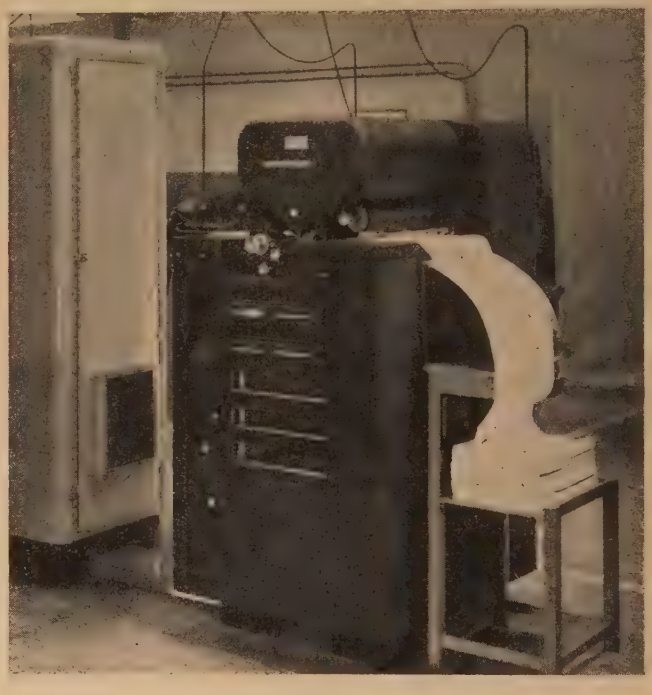
As almost an incidental item one reports that a 650 with magnetic tape will also be on the IBM stand—how times change; a year or two ago we would have regarded such a magnetic tape computer with awe.

**EMI Electronics** are hoping to have the premier showing at the exhibition of the EMIDEC 1100, which uses magnetic cores and transistors, and is claimed to be capable of handling anything from the clerical work of a medium-sized firm to the most complex problems of commerce and industry. A great deal has been heard about the developments of EMI—to some people a surprising entrant to the commercial data processor field—and this will be the first chance for most of us to see the equipment. EMI are also showing a 200 inch per second magnetic tape deck with up to 24 channels on 1 inch wide tape, and units of their 2400 computer which is still under development. It is expected that one of the parts to be demonstrated will be the input MULTIPLEXING unit which is said to keep pace with information fed to it by 300 high-speed typists.

On the analogue side there is the EMIAC II—a general purpose computer—which is already working on problems associated with nuclear reactors and is to be used for studying dynamic problems of guided missiles.

There is a forward-looking scientific computer on the **National-Elliott** stand, the ELLIOTT 802. This is a new transistorised, desk-size machine with 1,024 words on magnetic cores. Also, upholding their present high place in commercial installations in this country, will be a 405 computer complete with magnetic film and a fast line printer. This machine will later be delivered to a NCR company abroad, and it will have a strenuous testing period in front of a keen, knowledgeable and sometimes doubting audience.

A machine used primarily for scientific purposes—the ELLIOTT 402F—is also on exhibition together with its associated paper tape input/output equipment.

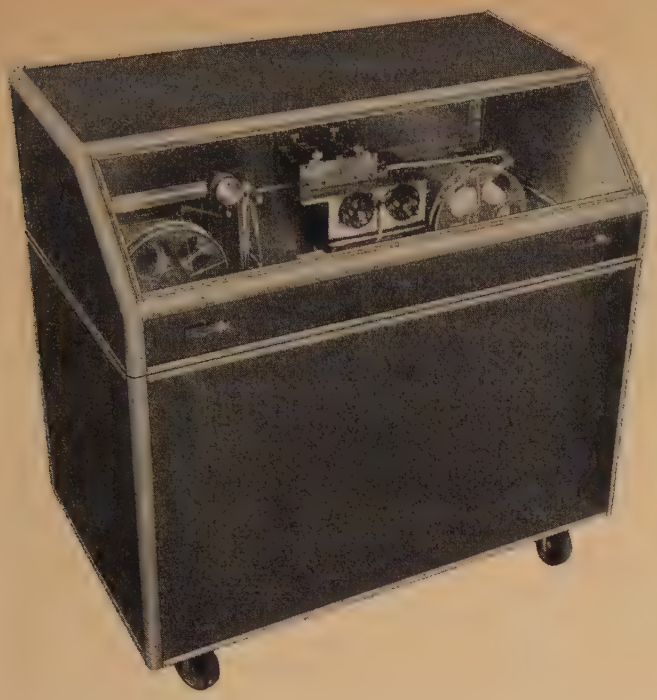


*Powers Samastronic Printer coupled to Leo II*

An unknown name to many people will be PLUTO—an Electronic Data Processing System offered by **Powers-Samas** and making its initial appearance. This magnetic drum computer system has been developed from the Ferranti PEGASUS and offers magnetic tape, paper tape and punched card input and output, and the high speed SAMASTRONIC off-line printer. Two SAMASTRONICS will be demonstrated, one working from magnetic tape and the other, with tabulating facilities, operating from the punched cards produced by the PCC—the second computer represented on the stand. The SAMASTRONIC in fact seems to be accepted as the fast printer for many British computers.

PLUTO will be represented by a model; the actual computer system is at the company's research laboratory at Whyteleafe, Surrey.

(*continued on page* 57)



*Creed Model* 3000 *Paper Tape Punch, operating at* 300 *characters per second*

Paper tape input and output served the original digital computers very well, but many people have complained of its lack of speed for commercial problems. So perhaps the most startling advance revealed at the exhibition is the CREED Model 3000 paper tape punch operating at 300 characters per second—ten times faster than the normal punching speed of paper tape. It is housed in quite a large cabinet with the bottom half available for the electronic circuit needed to connect it to any computer system. **Creed & Co.** report that whereas previously they were willing to adapt their existing teleprinter equipment for computer use, now the computer market has increased so much that they are able to design machines especially for computer use.

Creed are also displaying an experimental machine—the Model 1000 Output Printer—which is planned to print serially at 100 characters a second from paper tape. Though still under development this is a great advance on present teleprinter speeds and it is a logical step after their fast punch. The printed characters are not formed from type but by a 25 wire matrix. Advice would be welcome on the stand on potential customers' requirements, such as width of stationery, tabulating facilities, type of vertical spacing, etc.

A "new look" is evident on the stand, for nearly all the many Creed models on show have specially designed desks which fit into the idea of the modern office and make the equipment more suitable and attractive for operators.

The PEGASUS computer with four magnetic tape units will be in operation on the **Ferranti** stand, and demonstrations of tape techniques such as sorting, file updating and variable size file items will be given. There will also be models of PERSEUS and MERCURY, and a good appreciation of their range of equipment will be obtained from the display of a photograph of each Ferranti computer installation, numbering nearly forty.

A demonstration of data-transmission over teleprinter lines will be presented, with the stands of Creed & Co. and Burroughs Adding Machine Co. acting as outstations, sending and receiving information, and with PEGASUS processing the data. The necessity for a thorough checking system for transmitted data will be emphasised—a point that has hitherto often been overlooked in the enthusiasm for a new project.

Ferranti will also provide information or displays on digital differential analysers, plotting tables and computer control of machine tools.

The visitor will find things of interest other than electronic hardware—for instance **Lamson Paragon** cover that important subject of feeding the continuous stationery which receives the printed output of computers. The company is demonstrating several models of their FORMALINER Controlled Carbon Feed, and a new system on display in the fitting of FORMALINER to a Creed paper tape fed teleprinter. Many of the line printers or tabulators on various stands also feature this form of controlled stationery.

Computers will not be present on the **Leo Computers'** stand, but instead invitations will be issued to visit the near-by Cadby Hall and Elms House to see LEO I and LEO II in action on actual everyday jobs. The company feel that these actual working conditions will be more useful and instructive to visitors than special demonstrations arranged for the purpose of the exhibition. Also to be seen on Leo's own premises will be the DECCA magnetic tape unit, the FERRANTI drum unit and the SAMASTRONIC printer—all to be used on the LEO II computer system. A large LEO II computer system will present practically an inventory of British manufacturers!

The main emphasis on the **English Electric** stand will be on two systems, the DEUCE Mk. I, intended primarily for scientific work, and the DEUCE Mk. II, designed to form the central unit of a data processing system. The Mk. I will be present at the exhibition reading 64 columns from its punched card input. The Mk. II, which can use all 80 columns of punched card input/output and will normally be equipped with magnetic tape for auxiliary storage, will be represented at Olympia by certain of its units.

Also featured will be a fully operational LACE Mk. II—the latest version of the LACE analogue equipment, and English Electric's new card-operated typewriter.

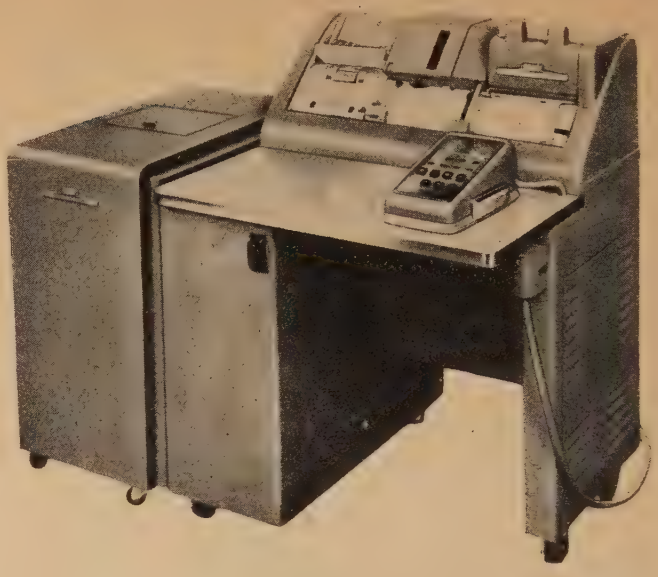
A relatively low priced but flexible computer—the STANTEC-ZEBRA—which can be used for a variety of

different applications, is being displayed by **Standard Telephones and Cables.** One of its uses—determining the most economical mixture of raw materials in the production of a range of products—will be described in one of the papers at the Business Symposium. It is this type of application, rather than in the processing of masses of documents to produce masses of other documents, for which the STANTEC-ZEBRA will probably be useful in commerce and industry.

**The British Tabulating Machine Co.** have given a great deal of attention to production control problems, and indeed have tried a dose of their own medicine. The 1201 HEC on view at Olympia will be performing the production control procedure in use at their own Letchworth factory, and many people are sure to be as interested in the application as in the computer itself. Alongside HEC will be the 555—which used to be termed an "Electronic Calculator" but by its impressive performances has earned its present title of "Plugged Program Computer."

Information will be available on the stand about Hollerith's advanced computer, the Type 1400, which will be produced in two to three years' time. The specification indicates that this will be a powerful mixed-radix, magnetic core and drum machine with an astonishingly fast word time. One big surprise is that plugboards will not be used at all for card input, output or printing since all these aspects will be under the control of the program.

From this large machine of the future to one of the most compact computers of to-day brings us to the BURROUGHS E101. This desk-sized computer can perform a surprisingly large number of calculations and has a novel method of programming in its use of pins pushed into special plugboards. Apart from this actual computer, models of **Burroughs'** big data processing systems, the DATATRON 225 and the DATATRON 220, will be on display. These machines are available in America, and Burroughs are considering marketing them actively in this country and on the Continent—it certainly looks as if there is going to be a great number of machines to choose from in the future.



*International Business Machines Data Transceiver Equipment for direct card-to-card communication*

**Solartron Electronics** will have two stands—one concerned with technical data and the other with business data. On view will be a character reading machine from the first production batch, one of which is to be delivered to Boots, and that intriguing machine the Automatic Keyboard Instructor (SAKI) for the training of card punch operators.

A newcomer to the ancillary computer equipment field is **Olivetti** who have several machines on view. The exhibits include a photo-electric paper tape reader with automatic tape winding and re-winding, operating at a speed of 600 digits a second, and a paper tape to punched card converter with a magnetic core memory, printed circuits, transistors and germanium diodes. These models will probably attract many visitors anxious to see if any new ideas are presented by Olivetti.

This article has been a survey of only some of the stands, but a rough count indicates that about a dozen different computers will be in operation at Olympia—this makes it the foremost exhibition of its kind in Europe, or indeed of anywhere outside the U.S.A. The Electronic Computer Exhibition seems just the place for any potential computer user to visit and take with him any doubters in his organisation.

*Console of National-Elliott 405*

*Film unit of National-Elliott 405*

**Members visiting the Exhibition are welcome to visit the Society's stand, No. 41, where they may obtain full details of the Society's activities for the information of non-members accompanying them. It is hoped that Members will take full advantage of this opportunity of introducing potential new Members.**

# AUTOMATION AND THE OFFICE–2

*by H. W. Gearing*

*This is the second and concluding part of a paper presented at the Annual Conference of the Chartered Institute of Secretaries held at Llandudno in May 1958, and is reprinted here by permission of the Secretary of the Institute. The numbers in the text refer to the references which were given at the end of the first part of this paper, in our last issue. Certain sections of the paper have been abridged, with the Author's consent.*

*The first part of this paper concluded with the submission of seven reasons for the slow arrival of full automation in the office. The Author now deals with each of these points in detail, recognising that they are controversial matters and expressing his personal views.*

## *Available British Equipment*

Many of the earliest developments of electronic computers took place in Great Britain, and the equipment commercially available for those wishing to acquire medium-sized computers for scientific work bears favourable comparison with that available anywhere else in the world. But the number of machines available for clerical work is still exceedingly small. Those potential users, such as my own company, who already have well-developed routines of punched card accounting and statistical analysis, have had to wait several years for the possibility of extending these routines by the hire of time or introduction of a computer.

Some intending users of computers for office work, faced with the need for replacing their conventional keyboard accounting machines or punched card equipment, have had to choose between a very comprehensive range of proved equipment, offered by the British subsidiary of an American corporation, and promises of British equipment which were in various stages of development, and about which conclusions could only be drawn by reference to the past technical experience of the particular manufacturer and to the drawing boards of their computer designers. The electrical engineering companies which have made most progress in developing computers for mathematical work seem to have turned their backs on potential business users. These manufacturers were prepared, in the electrical engineering sphere, to continue to discuss the detailed factory automation requirements of manufacturers with manufacturers' engineers, but said they did not want to set up large office organization specialist groups. In my view, computers will never be *sold* like conventional equipment: they will be *bought* by potential users who know what they want to do and are capable of applying the new equipment to their office problems after studying the available machines, their programming codes and how they are being used in the scientific field. This dichotomy of business and scientific users has been, in my opinion, unfortunate, because it has slowed up development in Britain.* I am firmly convinced that progress will be made by keeping all classes of users and designers together. This view is, I think, supported by the formation of the British Conference on Automation and Computation, in Group B of which this Institute is a member.

## *Publicity before Programming*

The Norwich City Treasurer, Mr. A. J. Barnard, in his paper read to the British Computer Society on 18 November 1957[17] stated that perhaps his biggest mistake was to allow the publicity which led the citizens to expect spectacular results, whereas with the knowledge gained after the installation was made they would have preferred to creep along in comparative obscurity for six months.

The same views were expressed to me two years ago in America, by similar brave pioneers. At General Electric, Louisville, considerable publicity was given in 1954 and 1955 to the acquisition of a Univac computer in October 1954: a year later, in the *Wall Street Journal* of 11 November 1955, it was reported that their payroll was taking ten times as long as expected. They had a large number of visitors and had virtually closed their doors when my party was due to visit that area in March 1956: in New York rumours were current that their payroll was being taken off Univac and put back on to keyboard machines! The manager of their Procedures Department and his staff devoted a whole day to us when we visited his installation. There was, of course, absolutely no foundation for the rumours: instead, we found a small team of programmers applying themselves to the coding of inventory control and sales statistics;

* When introducing his paper at Llandudno the author suggested that one reason for the comparatively slow development of suitable business equipment by the electrical engineering companies had been the preoccupation of engineering research and development staff with Government and commercial work of a more scientific nature, whereas in America the armed forces had placed large contracts with computer manufacturers for the development of equipment to carry out routine office work such as stores control; even in America some of these developments had taken many months to reach the prototype stage.

having done some programming ourselves we were able to discuss some of the details, although we did not have the experience of their particular trade or their Univac computer.

Some companies in America benefited from the publicity. One insurance company claimed that its more detailed statistical analysis had enabled it to stratify more finely the population of motor car drivers to which it quoted varying premiums, according to a subtle actuarial analysis of past experience. Another insurance company had been the first to have a computer in that particular State, and the influx of additional business when the computer was announced threw an additional load on the clerical staff when it was being "raided" to supply trainees for programming.

The advice of experience seems to be "Program before Publicity": it is being followed by more potential users every day. Programming includes planning the reorganization of basic data, of which more later.

## *The Economics of Office Automation*

When contemplating the installation of keyboard accounting machines, or punched card equipment for a specific function, the scope of the work to be mechanized is usually clearly defined and the limitations of the initial operations fairly definite. Some of the fringe benefits, in the shape of additional information as may later arise, can be foreseen. One is embarking on a capital expenditure of a few thousand pounds, which at normal rates of depreciation will represent a charge on the department equivalent to or less than the known expenditure on clerical routines which the new equipment will displace. The salesmen (technical advisers) of such equipment usually have some considerable past experience of redesigning basic forms for the collection of data and unit documents, of building control bars or connexion boxes; one usually gets away with a workable routine providing one doesn't attempt to do too much at one go.

The conditions when facing the possible acquisition of an electronic computer are, however, more complex. As Mr. Frank Wallace has pointed out in a recent book,[27] the feasibility study alone may involve considerable expense, as it will be much more complex than that to which we have been accustomed when reviewing ordinary office equipment. As I see it there are unknowns in many planes: the most important of these, if you are trying to achieve a *one-shot* process, is the problem of building into your basic data all the detail codings (definitions) necessary for their retrieval (in detail or summary form) at the appropriate time in the computer routine. Mr. Fairthorne has recently written a paper on this topic,[28] which brings the experience of technical librarianship and patent searching to the art of designing codes for mechanical recording with a minimum of redundancy.

In a punched card system, procedures of sorting and tabulating can be arranged which give each functional department a detailed schedule of information to which it may require to refer in the course of its work for a following period. For a payroll or any other straightforward accounting application, the same kind of product will be produced by the computer, only more quickly. There should be no difficulty here in calculating the relative cost of old system and new. But where you have a punched card or manual system of production or inventory control, or other management statistical routine, and you may be able to program the computer to save departmental detail records and to print out only the exceptions requiring attention, how can you assess the economics of the computer application? A considerable effort of programming and coding the computer operations, as well as classifying and routing the basic data, will be necessary; who can afford to undertake this unless he already has a computer on order? Economics or not, there must inevitably be many unknowns, because the ultimate information handling routine will be quite different from what went on before, or someone is going to lose a lot of money, by being satisfied merely with the computer producing what they had before, but faster.

## *Over-simplified Presentations*

The approach of some manufacturers to office automation is typified by the eye-catching symbol like electron orbit designs, which appear on some of the trade literature. A number of American organizations have produced film strips, some with a sound track accompaniment, to demonstrate what is meant by integrated data processing. Where these cover diagrams or symbolic representations of how a particular computer works, they are excellent training devices for programmers and other clerical staff who may not be able to understand the engineering detail, but who need to have a broad appreciation of logical design. Where, however, they show pictures of office blocks with information flowing round, they tend to over-dramatize and over-simplify the subject: often the commentator himself gets out of breath on such sound tracks.

In an appendix to Mr. Wallace's book[27] (p. 73) there is a brief non-technical description of how a computer works. There are similar chapters in many other books. Some of the effects which are obtained with conventional equipment by altering a plug board, or changing a contact piece on a control bar, have to be achieved on some computers by altering the program: it is important to realize that electronic computer programs may not always be altered as quickly as manual or mechanical routines, unless the possible need for alteration has been foreseen when the programs were written, by including variable parameters, etc.

Sometimes a high degree of optimism has been voiced by a computer expert, relying on his experience in mathematical work. In an address to the British Institute of Management 1955 Conference,[21] Dr. B. V. Bowden, Principal of Manchester College of Technology, referred to the 1951 population census figures when there were

over two million clerks in this country, to the increasing complication of office organizations in large manufacturing organizations and to the fact that more recruits each year were being attracted to clerical work. He asked "How many managerial decisions rest upon numerical criteria, which decisions could be made by a machine?" What he did not ask was "How much editing of information is done at present, leading to correction of errors, at each stage of summarization from basic data to management level?" The answer is a great deal, but in this manual process new errors and delays are often introduced. If we can incorporate this editing into our coding (definition) systems, the automatic retrieval of recorded information at the right time and in the right form will meet Dr. Bowden's hopes of the future.

## *Comparisons of Experience in Different Fields*

The four or more years of experience gained in the application of computers to (mainly) mathematical and scientific work has not only given the individual manufacturers considerable experience in design and maintenance, but has put into store programming techniques which have limited applications to data processing and are available for business users, not necessarily as ready-made sub-routines, but as techniques which can be developed and adapted to work on business data processing. Some of these are associated with the possible extension of statistical methods (operational research) into the solution of business problems and others are concerned with subjects such as business forecasting. On a more mundane plane, techniques developed for the manipulation of large matrices in a confined storage space will have an application to accounting and statistical analysis routines.

There are many subtle things to be learned by exchanging information in the computer field, and this is one reason why twenty-three societies and institutes have come together to form Group B of the British Conference on Automation and Computation.

## *Better Data before Better Information*

Many managements find that they need more up-to-date and more sensitive information than they have had in the past. This is the reflection in the economic and business sphere of the faster pace of modern industry, which in the first two streams of technical progress (automation) has been covered first by improved instrumentation and then by automatic controls, which respond to the feedback of the results calculated from data provided by improved instrumentation.

In factories where there have been great improvements in mechanical handling and assembling of components without improved counting devices, the replacement of the operative, who formerly kept an elementary record, by the automatic machine has led to the growth of the shop-clerk or "checker." Where component manufacture is not integrated into one line leading to the finished product, the initial cost of set-up time for modern high speed machinery has led to the separate production of components in long runs, and formal routines are then necessary for the control of stock levels of different items in work-in-progress. Where it is possible to estimate the stocks by weighing, then fairly accurate work-in-progress figures may be obtained, but in other cases improve counting and recording devices are required. The development of instrumentation in "piece parts" industries, as distinct from process industries, has been disappointingly slow. Here is a field of internal data where measurement may have to be improved if management is to have more sensitive information than in the past.

In the forecasting sphere there is often scope for better liaison between finishers and suppliers of partly manufactured goods, for the more rigorous planning of delivery requirements could lead to improved service and also to reduced stock levels. The electronic computer excels in processing a lot of detail: hence if we can stratify our analysis of information into more detail before processing it, and take more sensitive observations more frequently, we shall be able to pass more sensitive information to management.

Where we cannot obtain better data, as in forecasting, then the computer may be used to analyse past trends and seasonal variations on each category of sales, and the projection of this detailed analysis can be used to provide a forecast of future sales figures; but there are many pitfalls in relying too much on mathematical projections of economic time series, and all the computer does is to permit us to do the analysis and projection in greater detail. A stratified calculation will probably be more accurate than the broad estimates of earlier attempts at forecasting.

## *Training Staff for the Automatic Office*

A sub-committee of the National Joint Advisory Council, under the chairmanship of Mr. Robert Carr, M.P., Parliamentary Secretary to the Ministry of Labour and National Service, has recently reported on the adequacy of intake into apprenticeship having regard to the forthcoming increase in the number of young people leaving school.[29] The recommendations of this report relate mainly to craft apprentices and their training, but the report is worth reading by those concerned with training of people for office work.

The training of those who aspire to professional qualifications as accountants, secretaries or office managers will, I think, need to be reviewed. There must continue to be a fundamental training in the legal and conventional framework in which office work for corporations and other large bodies is carried out.

Those who are at present engaged on programming office work for computers come mainly from two camps. There are the young graduate mathematicians and statisticians who have been attracted into this work on

leaving the university or completing their National Service, and there are the older generations of office workers and professional men who have had to go back to school to learn about the new techniques. Forty years ago the hallmark of the skilled clerk was a facility in mental arithmetic. The intermediate clerical posts tended to become fewer with the mechanization of book-keeping, but new clerical functions sprang up in industry; some of these may now be superseded by the new equipment, but, as was pointed out in the *Board of Trade Journal*,[3] a higher level of skill will be required in offices; this is perhaps the greatest challenge to professional bodies such as ours, which have established syllabuses as a basis for training new recruits.

## *Major Considerations in Approaching Computer Applications*

To return briefly to Mr. Alfred Wilson's four major factors:—

(i) The carrying out of the feasibility study involves setting up a team, training it and keeping both management and staff informed of progress made. This study will in my view be facilitated if a particular type of equipment is in mind, although this is not the theoretically correct approach.

(ii) The development and use of new forms of management data will probably involve devising new forms of basic data and detailed coding, as well as deciding what people do with what they get, and why they really need it.

(iii) How can we reconcile centralized data processing and decentralized operations? Some essential records are always required locally. If the work of maintaining them locally gives out an automatic transmission of detailed or summarized data to a central data processing computer, this record needs to be associated with the collection of explanatory reasons for all significant variations from expectation, to be forwarded with each batch of data or as a summary for the period. If such reasons are to be ascertained automatically in the system of central data processing, then much more detailed coding of basic data will be necessary. This is another aspect of the major problem of organizing data for retrieval to which Mr. Fairthorne has referred.

(iv) It must be clearly appreciated that the net effect of automation on employees will be to raise the standard of employee required in the office. It will take time to introduce and hence it may be that normal wastage will take care of redundancies: the education of existing staffs in new coding procedures is not going to be an easy task.

A major difficulty in approaching computer applications is that you cannot know what you are going to need until you have written some of the program. You cannot write a program in a vacuum. You may be able to flow-chart the job, but the detailed flow chart will be affected by the particular equipment you expect to use. Hence you cannot begin to program seriously until you know which equipment you are likely to have.

It is not until you have begun to write a program that you realize how much storage space you require inside the computer. Time spent on programming work on several alternative machines is a good education, but exceedingly distracting. It seems that at a certain stage you must make a decision on the grounds of reliability and availability of equipment, etc., and then invest your time on that system. It looks as if the "electron orbit" designs on some computer literature may be a series of vicious circles!

When developing a program, there are many amendments to be introduced. As the late Professor Hartree pointed out in a lecture in London in October 1957,[30] it must always be borne in mind that the computer will blindly obey the instructions which it has been given. The precise effects within the machine of each instruction over the whole range of numbers must be ascertained when proving the program. The effect of significant changes in the nature and range of numbers to be expected in the data must be covered. Don't blame the machine for what the programmer has forgotten to tell it to do: it has not the innate ability of the most junior clerk in the office.

## *Computer Investigations and Automation in The Metal Box Company Limited*

I have so far talked mainly about the published reports and my impressions of what other people have been doing, and have said little about The Metal Box Company. *Automation* is not a new idea to us; in his review which accompanied the accounts for the year ended 31 March 1956, our Chairman referred to the methods employed in our factories to manufacture metal containers at high speeds, the specialized products to which these methods could not be applied, the expanding market for our products and the growth of our labour force. *Automation* had led to an unsatisfied demand for more skilled people and this was met by recruiting additional apprentices and greater emphasis on training at all levels.

Towards the end of 1955, reports from America suggested that the Company should investigate computer applications to office work more closely, and a Computer Division was formed to do this.

We are currently engaged on programming three models of jobs which will be improvements of essential parts of our management statistical routines. We are carrying out the work on different computers in order to gain experience, but it is taking longer than we had expected. We are building up a small programming staff in the Computer Division, which at present consists of two people with fairly long experience of our existing clerical and punched card routines, and two new men from the universities. We are finding that this combination of internal past experience and fresh training in statistical methods is working well.

The three model jobs are (i) an extension of our existing comprehensive statistical analysis of sales, at present carried out on sixty-five column equipment,

(ii) the application of a computer to the allocation of can production to six factories in order to minimize transport and set-up time, and (iii) the forecasting of our tinplate requirements by sizes and lacquers.

In each case a simplified specification of the real job has been drawn up, leaving out some of the detailed considerations that will need to be taken into account eventually and concentrating on various aspects of the work which will put a rigorous test on the storage capacity of the computer. We have had offers to carry out some of this programming work from the manufacturers, but we are endeavouring to do as much as possible ourselves, under their supervision, in order that we may know *how* the job has been tackled, and also to gain further experience in programming. This experience is proving to be an excellent continuation of the courses given by the manufacturers and this method of approach appears to be most satisfactory.

Since we formed our Computer Division a great deal of time has had to be devoted to the training of programmers and this training is continuing with the exercises on which we are engaged.

### *Acknowledgements*

I would like to acknowledge the help which I have received in forming my views and opinions from discussions with colleagues at head office and branches and with representatives of our oversea associates. I have also obtained considerable help from discussions with other members of the British Computer Society and we have been helped by the discussions which we have attended in their study groups. Our thanks are also due to the Northampton College of Advanced Technology in London and to the courses at other places where we have received a basic training in how computers work.

# LONDON STUDY GROUP REPORTS 1957–1958 (*continued*)

Most of the reports of the London Study Groups for last session were published in a previous issue of *The Computer Bulletin* (Vol. 2, No. 1, pp. 3–11).

Reports have now been received from three further groups and these are summarised below. Copies of the full reports are included in the sets sent to Branches for reference by members.

## PRODUCTION CONTROL

*Group 21 defined as the objective of production planning "to make the best use of all factors of production, including labour time." "Best use" was defined as the minimisation of any particular delaying factor (labour or machine down time, stock levels, delivery delays, or any combination of them) to give a minimised overall cost.*

### *General*

The Group represented complementary interests: computer producers, computer users actually engaged on the development of some form of Production Control, and those interested in common problems and exchange of information.

The equivalent Group of the previous year dealt with the problem of breaking down required production to the availability of raw material and components at the time they were required, and minimising the incidence of bottlenecks. The next stage was to consider sequence loading of jobs on to the available productive capacity.

### *Method of Approach*

Various methods of approach were presented and discussed, but were found wanting in some aspect. The main points to be considered in introducing production planning to a computer are the ability of the system to—

(*a*) Break down a production programme into requirements of component parts and signify when the production of each should be commenced. To do this a breakdown would be needed giving an analysis of required and available machine-group hours, with similar information about raw materials. The above could be done with punched card equipment. Accurate data on batch times, etc., and facilities for easy amendments are essential.

(*b*) Produce a machine-loading programme to give the required result in terms of starting and finishing times for each batch of components, to absorb amendments and to re-plan accordingly; the amendments might include changes in the production requirements, design changes, capacity changes, changes in the methods of production, or the timing of the output schedule.

(*c*) Determine new requirements of components and raw materials, from the production programme or sales forecast.

(*d*) Correct and adjust the estimates by comparing parts produced and the actual hours absorbed in production with the original forecasts.

(*e*) Calculate and integrate the spares, repairs and re-work programmes with the main production plan.

(*f*) Obtain data for management control as a direct result of the above.

It was hoped that these will help future discussions, which should be continued.

# GENERAL ACCOUNTING

*Group 5 studied the problems associated with the preparation of Interim Trading Statements and Interim Profit and Loss Accounts.*

These should be produced promptly and regularly (e.g. at monthly intervals), but it was considered that the application of a Computer to produce these would be uneconomic, unless use could be made of marginal computer time.

To supply management with the maximum information, the tabulations should be designed to show

comparative information for the current year or period,
budget for current year or period, and
figures for the previous corresponding period.

In addition to the data for the period, cumulative totals at the beginning and end of the period should be included. The extent of the analysis of data would depend on the requirements of the organisation.

In the preparation of the Interim Trading Statement, it was considered that the question of double entry would not arise, and the balances for Stock and Cash need not be brought in. The extent to which Depreciation would be included and the problem of double entry in connection with Balance Sheet preparation were left for further study.

# STORES CONTROL AND MATERIAL COSTS

*Group 4 continued on similar lines to those of the 1956–57 Group and, because of the complexity of the problem, this report must be considered as part of a continuous study.*

*The case study simulated a large engineering concern engaged in the manufacture of aircraft.*

## *General*

The overall control lines and co-ordination between Production, Stores and Buying are defined in terms of responsibility in planning and production cycles, and a flow chart is prepared outlining procedure.

## *Stores Control*

Stores Records would be based on mark sensed or dual purpose punch cards for assembly kit and requisitions.

Raw materials and bought-out parts control would cover phased production requirements to ensure economic stock holdings and highlight short supplies.

Stores movement would subdivide to Main (raw materials), finished parts, assembly line Sub-Stores, and Customer spare-part supply, with integrated programme control, including control of sub-contract work.

## *Costing*

Standard costing of assemblies would not be practical due to variations in customer requirements. Standard material usage (including a manufacturers' allowance) could be used for raw material and bought-out parts, labour costs being based on active job cards.

Normal issues costing would be integrated in the processing of the requisition card. The overall stores costing system would depend on Accountant's and Management requirements.

Management reports on stock holding and movements (including free stocks) of raw material, finished parts and scrap quantitative and/or priced would be a normal product of the program.

# CONFERENCES AND COURSES

## *New Digital Computer Techniques*

The Institution of Electrical Engineers are to hold Specialist Discussion Meetings on new digital computer techniques in London on the 16 and 17 February 1959, open to members and non-members of the Institution.

Provisional plans are to include sessions on Character Recognition, Peripheral Equipment, Low Temperature Storage and Switching Devices, and Special Aspects of Logical Design.

The Committee of the Measurement and Control Section of The Institution of Electrical Engineers will be pleased to consider offers of contributions which, if selected, will be included in the programme. A synopsis should, in the first instance, be sent to the Secretary of the Institution, Savoy Place, London, W.C.2.

Particulars of registration and other fees will be announced in due course.

## *Programming Pegasus*

Ferranti Ltd. announce that their next PEGASUS programming courses in London will be held on 8–19 December and 16–27 February. A similar course, the fourth of its kind, was held on 17–26 September at Southampton University, making use of the machine installed there.

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## *Liverpool Programming Course*

A ten-week series of evening lectures and practical work in the Mathematical Laboratory is being arranged by Liverpool University, starting on 14 January. This is an introductory course covering the main features of computers and associated equipment, and the basic ideas of electronic computing.

Further details may be obtained from the Laboratory, Ashton Hall, Ashton Street, Liverpool.

# SOCIETY AND COUNCIL NOTES

## *Council Meetings*

At their meetings in July (the first of the new Council) and September, Council dealt in the main with matters of organisation for the ensuing year. A list of the Committees appointed was published in the last issue of *The Computer Bulletin*.

Council also appointed representatives, or confirmed appointments, to act on behalf of the Society in discussions and liaison with such organisations as the proposed International Federation of Computer Societies and the International Conference on Information Processing; in this country the Society is represented on such bodies as the Advisory Committee on Automatic Coding Notation and committees of the British Standards Institution dealing with matters in the computing field, and is an active member of the British Conference on Automation and Computation.

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## *Membership of Council*

Council received with regret the resignation of Mr. H. G. Carpenter as the representative Council Member for West Midlands Region owing to his transference to another part of the country.

Dr. D. Rogers, Ph.D., has been elected to Council as the representative of the South Wales & Monmouthshire Regional Group, and Mr. D. H. Rees, B.Sc., A.R.C.S., as the representative of the Scientific and Engineering Group.

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## *Regional Branches*

Council has approved the formation of the Middlesbrough & District Regional Branch and of the Liverpool, Merseyside & District Regional Branch.

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## *Appointments*

Following the resignation of the Society's Secretary, Mr. W. E. Reed, for personal reasons (*The Computer Bulletin*, Vol. 1, No. 6, p. 186), the post was left vacant temporarily. Council have now decided to appoint an Honorary Secretary, and Mr. R. G. Dowse, A.C.A., has accepted this post. He has also been appointed to Council under Article 38.

Miss D. Aldis has resigned from her post of Assistant Secretary, and Mr. S. A. Tasker has been appointed in her place, with the title of Office Manager.

Dr. S. Gill has resigned as joint editor of *The Computer Bulletin* due to pressure of other engagements; three honorary joint editors have been appointed, M. Bridger, D. W. Hooper and R. M. Paine, to lead a team of associate editors and correspondents, so that the Society may obtain the widest possible coverage of news and events of interest to members. The joint editors are all members of Council.

Mr. A. J. Bray, M.A., A.C.A., member of Council, has been appointed Honorary Press Liason Officer.

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## *Overseas Computer Journals*

The Council of The British Computer Society has approved arrangements whereby members of certain overseas computer societies may subscribe through their local societies to its publications at reduced rates and reciprocal benefits are extended to B.C.S. members.

The arrangements apply to individuals who are members of The Association for Computing Machinery resident in North America and members of L'Association Française de Calcul resident in France or Algeria. The rates applicable are as follows:—

| | *A.C.M. members in North America* | *A.F.C.A.L. members in France or Algeria* |
|---|---|---|
| *The Computer Journal* (four issues per year) | U.S. $5.00 | F. fcs. 2150 |
| *The Computer Bulletin* (six issues per year) | U.S. $1.50 | F. fcs. 650 |
| Combined subscriptions for both publications | U.S. $6.00 | F. fcs. 2600 |

Subscriptions should be sent to the secretary of the local society for onward remittance in bulk.

In return, individual members of The British Computer Society Limited resident in the British Isles may subscribe to the following overseas publications at the reduced rates shown:—

| | *Per year* |
|---|---|
| *Journal of The Association for Computing Machinery: Communications of the A.C.M.* | £1 9 0 |
| *Chiffres* (Journal of A.F.C.A.L.) | £1 14 6 |

Subscriptions from members resident in the British Isles should be forwarded to The Office Manager, The British Computer Society Limited, Finsbury Court, Finsbury Pavement, London E.C.2.

The above rates are based on rates of exchange ruling at 31 July 1958. The arrangements for dollar exchange are subject to Bank of England sanction.

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## *Membership*

The total membership at 11 September was reported as 1,534.

# UNIVERSITY NEWS

## *Mercury Comes to Town*

The varied Institutes and Departments of the University of London which are housed in and around Gordon Square now add to their number the University of London Computer Unit. Members of the staff of the Unit, who until September had occupied desks in odd corners of the Physics Department of University College, have now moved to one of the Georgian terraced houses in the Square. The house itself (No. 44) has been modified and redecorated, and now contains the offices of the staff, while the computer, a Ferranti MERCURY, stands in a new single-storey building in the area behind Nos. 44 and 45.

At present input and output to the machine is by paper tape, but in due course it is hoped to add punched card equipment and magnetic tape, and possibly visual display of graphical and character output. Thus the installation will eventually be able to carry out data processing as well as the numerical computations for which it was originally intended.

The Computer Unit is a central institute of the University, directly responsible to the Senate. The purpose of the Unit is to supply computing facilities to all departments of the University, and a preliminary survey has shown that between 30 and 40 research groups in the various Colleges will be using the machine in the near future. Requests for its use are in fact coming in from workers in many fields, including physics, chemistry, engineering, physiology, psychology, statistics and medical sciences. For research arising in the University time on the computer is free; for other Universities and Colleges without adequate computing facilities of their own a small charge will be made as a contribution to the cost of maintenance. A limited number of hours may be available for work sponsored or financed outside the University, and for these the charges will be based on current commercial rates.

An important part of the Unit's activities will be concerned with the training of research students and others in methods of computing and programming. The common room and library, which occupy the ground floor of No. 44, can in fact be used for lectures or courses for small groups (up to 30 people). When a larger attendance is expected an excellent theatre is available in the nearby Institute of Archaeology.

Three programming courses on the MERCURY computer have so far been given, the most recent from 25 September to 10 October. The total attendance, mainly research students and staff from the Colleges of the University, has been more than 120. The first course of programming with Autocode was held in May. Autocode is an automatic programming system devised by Mr. R. A. Brooker of the University of Manchester who himself contributed to the lectures. This system has attracted the attention of many scientific research workers since it makes it possible to use the computer without spending many weeks on learning the conventional programming methods. It is planned to hold regular courses, both on basic programming (8–10 days) and on Autocode (2–3 days), to encourage potential users to do their own programming. In this way it is hoped eventually to run MERCURY 24 hours a day whilst maintaining only a small body of permanent staff. (Attendance at courses is not confined to members of the University of London and future courses will be announced in *The Computer Bulletin*.)

Research in numerical analysis, programming methods and in specific applications of the computer, presents the third important aspect of the Unit's activities, both for the staff and for a limited number of students working for higher degrees of the University in these subjects.

The present staff includes, in addition to the Director (Dr. R. A. Buckingham) and Deputy Director (Dr. A. R. Edmonds) three lecturers (Dr. M. J. M. Bernal, Dr. D. C. Cooper and Dr. P. G. Burke), two research assistants and several other more junior members of staff in course of training. Enquiries concerning courses and the work of the Unit should be addressed to the Secretary, Miss J. A. Spencer, University of London Computer Unit, 44 Gordon Square, London, W.C.1.

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## *Training in Computing Methods and Statistics*

The London School of Economics is making arrangements of interest to boys and girls who have mathematical ability and wish to use this later in careers in business, accounting, or scientific work. The object of the new arrangements is to turn out graduates with a specialised knowledge in certain mathematical subjects plus a general appreciation of the wider field of economics. The graduates will have sufficient technical knowledge to enable them to work with groups responsible for programming for computers or for operational research; at the same time, they will understand the wider economic questions involved in the job.

The new arrangements will be developed within the general framework of the B.Sc.(Econ.), which requires three years' study. General instruction will be provided, especially during the earlier part of the degree, in economics and allied subjects; the specialised studies will be based on

(*a*) Theory of Statistical Methods, including the Theory and Applications of Probability, and
(*b*) Numerical Analysis and Computing Methods with applications in Economics, Statistics and Accounting.

There will also be a choice of further theoretical and applied subjects (such as advanced mathematics, actuarial statistics, and advanced accounting).

The preliminary requirements are in general as for the B.Sc.(Econ.), but must include an adequate knowledge of mathematics. The School hopes to set up scholarships (possibly of £400 a year for three years, without any means test) for entrants likely to distinguish themselves in the new courses.

Further information may be obtained from The Registrar, The London School of Economics and Political Science, Houghton Street, Aldwych, London, W.C.2.

# BRITISH CONFERENCE ON AUTOMATION AND COMPUTATION

## *Group A—The British Group for Engineering Applications of Automation*

*The Computer Bulletin* for February/March 1958 reported the background to the formation of the British Conference on Automation and Computation and also gave information concerning Group B, The British Group for Computation and Automatic Control, of which the British Computer Society is a member.

Group A—The British Group for Engineering Applications of Automation has been formed with the following initial membership:

Institution of Mechanical Engineers
Institution of Civil Engineers
Institution of Electrical Engineers
Institution of Chemical Engineers
Institution of Production Engineers
Incorporated Plant Engineers
Institute of Fuel
Institute of Marine Engineers
Institute of Materials Handling
Institute of Metals
Institute of Welding
Institution of Engineering Inspection
Institution of Gas Engineers
Institution of Mining Engineers
Institute of Municipal Engineers
Institution of The Rubber Industry
Institution of Structural Engineers
Iron and Steel Institute
Plastics Institute
Royal Aeronautical Society
Society of Instrument Technology

The primary object of the Group is "to foster the development of the engineering applications of automation." In all other respects the objects of the Group are as for Group B.

Honorary Officers elected for Group A are:

| | | |
|---|---|---|
| Chairman | Dr. D. F. Galloway | Institution of Mechanical Engineers |
| Vice-Chairman | Mr. J. S. Brough | Institution of Chemical Engineers |
| Vice-Chairman | Sir Walter Puckey | Institution of Production Engineers |
| Honorary Secretary | Mr. B. G. Robbins | Institution of Mechanical Engineers |

Secretarial services for the Group are to be provided by the Institution of Mechanical Engineers, at 1 Birdcage Walk, Westminster, London, S.W.1.

# BOOK REVIEWS

## *Switching Circuits and Logical Design*

Massachusetts Institute of Technology, 1958; 686 pages, illustrated. (New York, *John Wiley & Sons, Inc.*, $14.00; London, *Chapman & Hall*, 112s. 0d.)

This book is a textbook for Professor Caldwell's course on Switching Theory at Massachusetts Institute of Technology. It derives several virtues from this origin: the unity of the treatment, and the way that the student is carried forward naturally from one topic to the next; the mass of examples to illustrate methods of design, and the painstaking way in which these design procedures are carried through in full detail.

A wider range of design techniques is described than has ever before been collected together in one unified treatment. Much of the material comes from papers written by Professor Caldwell, his associates and students. It is less concerned with actual applications than is Keister, Ritchie and Washburn's "Design of Switching Circuits" or the Harvard University "Synthesis of Electronic Computing and Control Circuits." This is chiefly because it is concerned with methods which have very general application.

It might be supposed that a comprehensive theory of switching circuits would enable the engineer to apply a fixed design procedure and arrive at an optimum design. This has not been true in the past, when design of switching circuits depended heavily on the intuition of the designer. It is still not true, and probably never will be, however much the theory is developed.

One reason for the absence of a direct design procedure is the extreme difficulty of stating problems in sequential circuits in a complete form. Practical problems, stated in verbal terms, are nearly always found to be insufficiently defined when they are subjected to analysis. An attempt to design a circuit for them shows up the deficiencies, and the "customer" has to be asked some more questions about what the circuit is to do. These deficiencies are essential ones, not just the cases in which some latitude in circuit response is allowed—which is a further feature of many practical problems.

A second reason for the absence of a direct design procedure is the vagueness of the idea of an "optimum." The number of contact springs or the number of logical units is often used as a criterion, but questions of timing or even of the understanding of the service engineer may be important.

Apart from these features (which are not always present), the design of efficient sequential circuits can be extraordinarily difficult, and therefore is a challenge to the engineer. The methods described in this book do not produce answers by mechanical techniques. Instead, they enable the designer to look at the problems from different angles in such a way that the useful tricks become obvious.

Logical design of electronic circuits is treated in this book as a second stage, after relay circuits have been mastered. The reader interested in logical design, but not in relay circuits, will find this a drawback. If one wishes to study both types of design, then the order chosen in the book is a good one because the problems of relay circuit design are more interesting and the techniques more varied. Only three of the fifteen chapters concern logical design of electronic circuits. A wide variety of circuit elements are treated, to show that the design techniques are capable of wide application, but in many cases the circuits and the nomenclature for logical units differ from current electronic computer practice.

In inventing and solving so many design problems it was almost inevitable that some errors would creep in. The errors the reviewer has found are a sneak circuit in figure 6–45 and a "cut-set hazard" in figure 12–2. These errors were spotted by intuition, built up during the design of circuits by largely intuitive methods. There is no doubt that, up to a certain level of complexity, intuitive methods of relay circuit design are as good as the systematic methods. But such intuition cannot be formally taught, so the course given by Professor Caldwell deals with systematic methods. To quote the author:

"It will become apparent that in many instances mathematical steps can be replaced by processes of physical reasoning, and that much network reduction can be accomplished by working directly with circuit diagrams. The development of this sort of skill is desirable, and it is one of our primary aims. We approach it by a study of algebraic methods because these tend to systematise our efforts, and to impart a certain degree of sure-footedness to the designer. Indeed, at times it becomes difficult to tell whether one is using algebra or a more highly developed form of circuit sense" (p. 87).

These remarks could apply to the whole process of logical and relay circuit design.

D. W. Davies

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## *Business Electronics Reference Guide, Volume 4*

Edited by Peggy Courtney, 1958; 602 pages. (New York, *The Controllership Foundation Inc.*, $15.00.)

This is the fourth volume of the Business Electronics Reference Guide issued by the Controllership Foundation of America, and the fact that it has grown to 600 pages from the 170 pages of the second edition of 1955 is some proof that its coverage has kept pace with the expansion of business applications of computers over these years.

According to the Foreword, it is proposed that this shall be the last of the series. The experimental phase of the application of computers to business which was the subject of study by the Controllership Foundation as a research project may now be regarded as over.

The book sets out to be a comprehensive account of computer systems actually in operation on a normal run basis on the processing of business data. It includes business and economic data processing by Government agencies (excluded from previous volumes), but excludes scientific and engineering applications except when performed on the same machine as business applications. The listing of these applications with related indexes and summaries occupies rather more than half and much the most useful part of the book. It gives some idea of what computers are actually being used for, though of course it cannot hope to be more than a list. Space does not permit any indication of the volume of work being handled or the value of the work or the methods used.

The remainder of the book consists of descriptions of digital computers available listed by makers, and lists of computing centres and of courses of training, information which is available in other publications. The last 200 pages is a bibliography of periodical articles on computers and applications, listed according to the journals in which they have appeared, probably the least helpful arrangement, though a brief topical index is better than its title suggests and gives not only the subjects dealt with but also the names of firms mentioned.

(Mrs.) J. M. Vincent

# BOOKS RECEIVED

*The Preparation of Programs for an Electronic Digital Computer, 2nd Edition*

Wilkes, Wheeler & Gill, 1958; 238 pages. (Reading, Mass., *Addison-Wesley Press Inc.*; London, *Academic Books Ltd.*, 60s. 0d.)

*Proceedings of the Fourth Annual Computer Applications Symposium, October 24–25, 1957*

126 pages. (Illinois, *The Armour Research Foundation of Illinois Institute of Technology*, $3.00.)

*Scientific Programming in Business and Industry*

Andrew Vaszonyi, 1958; 474 pages. (New York, *John Wiley & Sons Inc.*; London, *Chapman & Hall Ltd.*, 108s. 0d.)

*Editorial*

# WHAT TYPE OF SOCIETY?

If you were asked "Is the British Computer Society a scientific society, or a professional society, or something else," what would be your answer?

Perhaps we are really a blend of several disciplines. A scientific society means, surely, one devoted purely to the study and theory of a particular science such as physics, engineering or sociology. Yet we possess members who are far more interested in the profit and loss aspect of computers than in the subject of electronic engineering, and also members who are concerned with the impact of computers on management rather than with the techniques of sophisticated programming.

On the other hand we are not a professional society such as the various accountancy bodies or legal societies. Our members' interests are far too broad to be covered by one profession, and there is no similarity of activities that could be covered by examinations, or by regulations governing the entry of people into computer work.

There are also obvious objections to calling us a business, a debating, a benevolent or a literary society. We are certainly, however, a body of persons united for the promotion of mutual benefit, knowledge, discussion and pleasure, and we can be proud that we embrace so many types of training and influence. We should be careful, however, that we do not scare away any potential members by the use of one label only—such as scientific or professional; the wider the interests of our members, the greater the benefit to us all.

## COMPUTER COMMENT

### *Flashback*

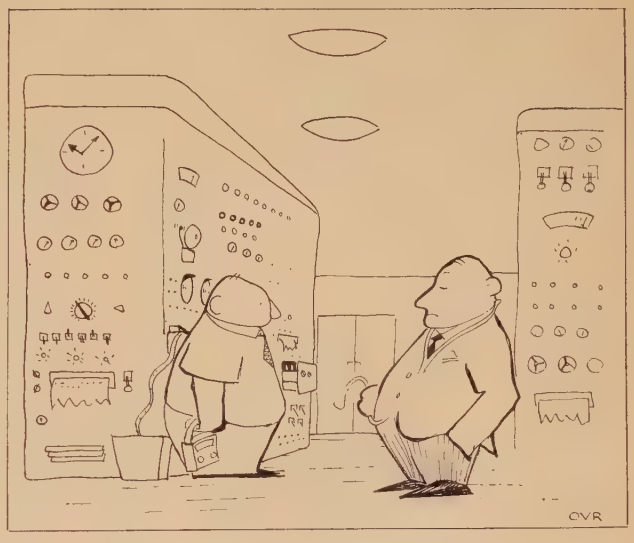
The Electronic Computer Exhibition and related symposia have come and gone. A review of the Business Symposium and the Exhibition appears elsewhere in this issue. Attendances exceeded targets and the interest in this comprehensive display has been widespread. Even that sober journal *The Accountant* gave the occasion a special issue; whether accountants as a body really understood what it was all about is perhaps hinted at by an editorial comment that at Olympia "electronic panels were to be seen flashing off on almost every stand."

* * *

### *"Peripheral" Organisation*

Those who heard H. W. Gearing and D. W. Hooper give their paper reviewing these Olympian efforts will doubtless regret that the abridged version in this issue omits many of the amusing asides on an otherwise solemn event. Mr. Gearing, while congratulating those responsible for the organisation of the Business Symposium on its success, commented that the "peripheral services and equipment at Olympia were not apparently modified to cater adequately for the number of people attending. . . ." The limited cloakroom facilities, the one lift and single staircase "made the Symposium suffer from the same difficulties as our early computers—inadequate input and output facilities."

Mr. Hooper admitted some "errors in programming"; there had been no opportunities for "parallel running and subsequent de-bugging." Further, there was always, he said, the unforeseen difficulty: "as the member of the Committee responsible for getting the audience seated in time for each session to commence, I omitted to discover, until some five minutes after the first morning session was supposed to have started, that a train from Earl's Court to Olympia spilled nearly half the delegates on the station platform at exactly 10.12 a.m., leaving some 350 gentlemen (the ladies were never late) three minutes to walk rapidly to the National Hall, to ascend to the gallery together in the one lift or by the single narrow staircase, and on arrival there to deposit in the cloakroom simultaneously their overcoats, hats, umbrellas, brief cases and, in some cases, sandwiches, golf-clubs and even a folding camp chair."




*'A definite case of amnesia, I'm afraid'*

* * *

### *The Vanishing Delegate*

During the Symposium, Mr. Hooper reported, "a delegate left his seat, came up to me at the back of the hall, showed his ticket and inquired where he could find the Apex Restaurant. I explained that it was being used for the Symposium and that we were in fact standing in it. He then asked where the Business Computer Symposium was being held. I explained that we were now listening to it. Thanking me politely for being so helpful, he quietly left the room, never to be seen again. Do you think," asked Mr. Hooper, "he is still looking for the Business Computer Symposium of 1958, or was he perhaps the restless ghost of Charles Babbage, unable to comprehend these modern marvels?"

# CORRESPONDENCE

## *Branch Membership*

Sir,

May I draw the attention of members of the Society, through the medium of *The Computer Bulletin*, to recent moves by certain local branches to obtain Council's approval to a new category of membership, namely Branch Membership.

The purposes of this new category are

(*a*) to increase the Society's membership,

(*b*) to increase the support for branch meetings and activities,

(*c*) to improve the financial position of branches, and

(*d*) to relieve the main society of some of its financial responsibilities with respect to branch activities.

It is proposed that Branch Members would

(*a*) be entitled to attend meetings of the local branch to which that member belongs and participate in any other activities associated with it,

(*b*) not have voting powers in the Society's elections except those concerned only with the branch to which the member belongs,

(*c*) not receive the Society's publications, and

(*d*) would pay an annual subscription in the region of five to ten shillings.

Branch activities in an organization of this nature are of prime importance, and regular meetings of both general interest and special applications are essential to its success. In order to maintain the extremely high standard of lectures, adequate support must be achieved and maintained. The position at the moment is somewhat ludicrous since, in order to achieve a reasonable attendance and to give adequate support to the speakers, meetings have to be open to all. Consequently, the majority of those attending are not members, and as far as can be ascertained are not inclined to become Ordinary Members. The frequency of attendances of non-members is low, probably less than half, thus indicating a large potential support, but not to the extent as to induce full membership. The grade of Associate Membership does not fulfil the requirement since it has an age restriction. The object is, therefore, to open the meetings of local branches to those people who would not be sufficiently interested in the full programme of activities to become Ordinary Members.

The estimated effect of the formation of such a category is that membership in the provinces would increase considerably, probably trebling in a year. If the subscriptions were devoted to the branches, the Society's commitments to the branch expenses would be considerably reduced, and each branch would be able to extend its activities. This, in turn, should increase membership and stimulate further interest in the Society's activities in the field of computation. Meetings in the branches could then be open to members and guests only, thus adding further inducement to membership.

To quote an example of this, the local branch of a national society has 120 main society members of different grades and, in addition, 256 branch members, who pay five shillings annual subscription. These figures would appear to substantiate the above estimates. In the case of the B.C.S. the number of people intimately concerned with computers and computing is relatively small, but the potential of interested parties is large, and it is the support of these people we should seek.

It is a significant point that membership of the Society doubled approximately in the period 31st October 1957 to 30th April 1958, and the Council in their report attributed this to the formation of the regional branches. The growth of the Society is now in the hands of the branches, and we in the Hull and East Riding Branch of the Yorkshire Group feel that this new form of membership will be a positive step towards this growth and to the success and prosperity of the regional branches.

Branches in Yorkshire have asked the Council to consider this proposition, and I would like to enlist the support of all local branch committees in urging the Council and the Finance and General Purpose Sub-Committee, in particular, to approve this new class of membership by suggesting that members' views should be expressed through their local committees to the Council.

Yours, etc.,

A. KING

*Vice-Chairman,*
*Hull and East Riding Branch*

*Brough, E. Yorks.*

[*Editors' Note: Two other readers, both from Hull, have written on similar lines with proposals for a category of Branch Membership. Space does not permit us to print these in full. We suggest that others supporting these ideas should follow Dr. King's proposal in the last paragraph of his letter above and express their views through their local committees.*]

## *The Ten-Year Itch*

Sir,

With reference to your Editorial (October – November 1958), the computing art has certainly passed its first decade. I doubt whether it still can be deemed to be in its 'teens now that it incorporates the work of, amongst others, Fibonacci, Napier, Newton, Gauss, Horner, Bessel, Chebyshef, d'Ocagne, Andoyer, Peters, Hotelling, Aitken, Neville, Comrie, Lehmer, Miller.

Usable automatic computing devices are admittedly only about ten years old. Usable computing methods with these or any other devices are not. They did not arise as a totally independent by-product of electrical engineering and the Second World War, but are in the direct and inextricable line of descent that reaches back, in Western Europe, to 1202.

Automatic machine computing demands, as do all new techniques, revaluation and novel development of the existing "state of the art." It ignores the existence of this art at its peril and, as experience has shown, at very heavy cost.

Yours, etc.,

R. A. FAIRTHORNE

*Farnborough, Hants.*

(*Continued on page 76*)

# A REVIEW of the COMPUTER EXHIBITION and BUSINESS SYMPOSIUM

by H. W. Gearing and D. W. Hooper

*The Electronic Computer Exhibition and the Business Computer Symposium were staged at Olympia, London, from 28 November to 4 December 1958.*

*This review is an abridged version of a paper read to The British Computer Society on 18 December 1958. H. W. Gearing (The Metal Box Company Limited), a member of the Society's Council, is Chairman of the Business Group, and one of the Joint Honorary Editors of The Computer Journal. D. W. Hooper (National Coal Board) is also a Council member and its immediate past Chairman; he is one of the Joint Honorary Editors of The Computer Bulletin and was a member of the Business Symposium Steering Committee.*

*The authors wish to acknowledge the help they have received from manufacturers in compiling information concerning the exhibits, and from Messrs. Reynolds and Bulcock of The Metal Box Company Limited in summarising this information. Any opinions expressed in the paper are the personal views of the authors.*

## *INTRODUCTION*

*Mr. H. W. Gearing:* The idea of having a computer exhibition and symposia on scientific and business applications in the autumn of 1958, so that British achievements in the development and application of computers could be publicised, originated in a suggestion made by the National Physical Laboratory through the Brunt Committee to Lord Halsbury, whose paper on "Ten Years of Computer Development" was presented to this Society a little over two months ago.*

The Exhibition has marked approximately the end of the first decade of electronic computer development in the U.K. and was, as Sir Harold Gillett, chartered accountant and Lord Mayor of London, said in his opening speech, "the most comprehensive exhibition of electronic computers ever held. . . ."

Tonight, we have to ask ourselves, as an impartial professional group, whether the Exhibition and Symposium have justified the tremendous amount of work which obviously went into them, by those who served on various committees, by those who wrote the papers, by the many employees of contractors and manufacturers who worked against time and round the clock to get the Exhibition completed. Are we in Britain as computer users, engineers, manufacturers or programmers any wiser, or has it added to the stature of a new industry? Programmers might ask whether they are writing any better programs as a result of the Symposium.

My thought is that these recent events have stimulated discussion, given a new industry a place to be proud of, as my statistics will presently show, and from the stimulus of the papers presented and such ideas as time-sharing exhibited (of which more anon) has given those who stopped to think about what they saw, an impression that will have a lasting stimulus in the work they all still have to do.

*Mr. D. W. Hooper:* May I say at the outset how impressed I have been during the Committee work by the absence of rivalry between companies to boost their own products unduly. There was a most remarkable team spirit, perhaps even more remarkable because, when the idea for such an Exhibition and Symposium was first mooted, there was some argument between the electronic engineers and the makers of office appliances as to which could put on the better show. As you know, in the end it was staged jointly, and I think each learned quite a lot from the other; perhaps it would be fair to say that two years ago the electronic engineers knew a great deal about designing computers (and even occasionally producing prototypes!) while the office machine manufacturers knew a great deal about selling machines off a production line. To-day the position is very much more in balance, with a healthy mutual respect for these differing functions.

The only other point of detail to which I would refer was the difficult task of persuading twenty-three authors to prepare papers in time for them to be set in type, proofed, printed and distributed sufficiently far in advance for delegates to absorb their full implication and come to the Symposium fully briefed to stimulate lively discussion. It is perhaps natural that in this field of continuous development authors showed a natural tendency to defer final amendment and clearance of their papers with their senior officers or controlling authorities until the final proof stage.

As a result, distribution of the papers was later than intended; delegates had not time to absorb their content. Perhaps this fact was responsible for the small number of serious contributions to the discussion which followed each paper; there were, however, many questions and no discussion period "dried up."

## *THE BUSINESS SYMPOSIUM*

There is one point which seems to me perhaps the most important factor in determining whether the Symposium as a whole may be termed a success or not.

I suggest that the opening paragraph of the first paper of the Symposium (by Mr. N. C. Pollock, *Stewarts and*

* The Rt. Hon. the Earl of Halsbury: "Ten Years of Computer Development," *The Computer Journal*, Vol. 1, p. 153.

*Lloyds*) summarised what many of those who planned the Symposium had in mind.

> "Broadly, a commercial computer can be used in two ways:—
>
> (*a*) to do work which was already being done (or which would have to be done) in more conventional ways,
>
> (*b*) to do work which could not have been attempted by ordinary means.
>
> Both classes have their advantages and disadvantages. In the first a routine is established, the requirements are usually known, and some standard can be set against which the computer's performance can be measured. All this can be very helpful, but established routines often inhibit a fresh approach, and immediate financial saving is not the only goal of administrative efficiency. In the second, although the planner has only to consider the restraints inherent in the problem itself, he may face a real difficulty in convincing management that a problem exists that needs to be solved."

When planning first started two years ago, it was expected that by the middle of 1958 sufficient machines would have been delivered and installed for both these fields to be described and demonstrated. In the event, as is well known, deliveries of machines have not always been up to schedule, those responsible for their installation have not always been sufficiently far-sighted in their pre-planning, and installation has taken longer than anticipated. Effort has in the main been concentrated on doing work which is already being done by conventional ways.

I would have hoped that after the Symposium one could answer a number of important questions with a firm "yes." I have in mind such questions as

> Did the papers, in general, show that computers now at work on commercial problems have advanced beyond the performance of routine functions?
>
> Has the introduction of computers been accompanied by any changes in management techniques, either as a prior requisite or as a consequence?
>
> Can it yet be said that computers are being used to solve fundamental management information problems, instead of being used mainly as faster and somewhat more impressive office machines?

I feel that on balance the answer must, strictly, still be "no." The redeeming feature, however, was that at some point in every session one caught glimpses of creative thinking, of future plans which promise to raise the computer from an office aid to a craftsman's tool.

*Mr. H. W. Gearing:* The papers at the Business Symposium have already been summarised in *The Computer Bulletin* (*Vol.* 2, *No.* 3). They are to be published in full in 1959 by *The Pitman Press*.

I would like to begin by explaining the place, in a business symposium, of the two mathematical approach papers, those of Mr. A. Muir (*J. Bibby & Sons*) and Mr. D. G. Owen (*United Steel Companies*). As one who has campaigned for the bringing together of all computer users in this kind of discussion, I regret that the symposia were held in two parts. Many business users would have been stimulated to hear the papers on automatic programming, mechanical translation, speech recognition, automatic control, mechanisation of literature search, etc., which were given earlier at Teddington. I am glad to hear that they will be published later by H.M.S.O.*

Mr. Muir (whose paper on Automatic Sales Forecasting you will have seen in *The Computer Journal, Vol. I, p.* 113) explained how a STANTEC ZEBRA computer is being used to calculate formulae for cattle food mixes to be manufactured from available materials at minimum cost. Mr. Owen's paper gave general examples of computer applications to statistical work, linear programming and simulation: representatives of steel companies joined in the subsequent discussion.

With the exception of these two authors and Mr. M. A. Wright (*National Physical Laboratory*), whose paper on the Family Expenditure Survey on a DEUCE will be of interest to those who plan to do major statistical jobs on a computer, few of the authors admitted having done any significant amount of computer programming themselves. In fact several speakers denied having done any programming at all! When one has regard for the importance which is attached to personal experience of detail work during service under articles in the professions of accountancy, engineering and law, this is a little surprising.

Like its counterpart at N.P.L., the Business Symposium also was international. We had Mr. Lawler (*Irish Sugar Company*) to tell us that Irish Growers now received promptly their weekly statements of account for beet delivered, based on sampled sugar content, whereas previously figures had been based on estimates and were heavily in arrear during the season. This was the experience of many speakers: not a saving in cost, but more prompt figures.

Mr. K. E. Schang (*Trygg-Fylgia Insurance Group, Sweden*) brought an atmosphere of *aurora borealis* with him as he disclosed the plans for the dawn of electronic data processing in a group of Swedish insurance companies on the first *Ferranti* PERSEUS, now under test at Bracknell. The long Arctic night before the dawn was simulated by the time it would take to convert existing records to magnetic tape—about nine months, a significant portion of the computer's life. This load was also stressed by Mr. D. G. Pedder in connection with the *Radio Rentals* magnetic film of 600,000 live accounts on a NATIONAL-ELLIOTT 405 already delivered in August last. Several other overseas speakers contributed to the discussions.

Mr. D. Greensmith (whose paper with Mr. Thompson we enjoyed earlier in the year†) gave further details of his journey towards a completely integrated system with an EMIDEC 1100 as its centre. His company (*Boots Pure Drug Company*) are financing research work in character recognition, punched tag and other media equipment and other devices for easier input to the computer. The banks are doing likewise (*Mr. Temple, Lloyds Bank and London Clearing Bankers Electronics Sub-Committee*) and would that more brave pioneers would recognise these real problems of mass input data in the business sphere of applications.

Those who had begun their work by calling in the services of experienced computer programmers in the business sphere had good progress to report. Mr. N. C. Pollock (*Stewarts*

* *Symposium on Mechanisation of Thought Processes* to be published in 1959 by H.M.S.O.

† D. S. Greensmith and J. G. Thompson: "A Case Study in Commercial Electronic Data Processing," *The Computer Bulletin*, Vol. II, p. 12.

*and Lloyds*) gave his eight months' experience on a LEO II at Corby where a payroll of 4,000 is in operation: the take-over from existing routines is a big task but while the accountants are dealing with this, a most interesting program has been put into operation to plan the ore digging for balanced material deliveries to furnaces where the sulphur content of the melt has to be carefully controlled. Mr. A. Bradley (*Ford Motor Company*) using the service bureau of the LEO organisation had a payroll of 21,000 running: this was proving to be more flexible than the old system, but the main application when they have their own LEO II in 1959 will be stores control.

Computers to the rescue of overloaded punched-card equipment seemed to be the theme of several papers. Mr. G. Sherlock (*S.W. Gas Board*) and Mr. W. H. Sargent (*Western Region, British Railways*) gave details of output from their *Powers* PCCs, each of which tackled other jobs as well as a large payroll. In the hands of skilled programmers it is apparent that these and other smaller machines can solve many headaches in business. Mr. D. L. Rowlands (*A. C. Nielsen Company*) proved that his IBM 650 equipment was cutting time required for at least two major jobs, with significant cost savings on one of them. Mr. A. J. Brockbank (*Glaxo Laboratories*) gave a review of his plans to use an EMIDEC 1100, from which we gathered that programming of work already substantially covered by punched card routines, was fairly easy going. Mr. J. F. Body (*Newton Chambers and Co., Ltd.*) reviewed his payroll procedures on the NATIONAL ELLIOTT 405.

An unexpected and remarkable contribution about a program that has been running for some time came from Mr. R. B. Baggett, the Managing Director of a high quality knitting factory in Staffordshire. One of the several DEUCE computers available at Stafford was being hired each week to calculate the measured winding of yarns for each run; this had resulted not only in decreased costs, but also in better quality control.

I have left until near the end three of the more sophisticated applications of a computer. Mr. R. G. Hitchcock (*Tube Investments*) has had an IBM 650 for about 17 months and has been programming for 2½ years. His computer will be applied (*inter alia*) to selection of most economic raw material for tube manufacture. He does not however use linear programming methods. Mr. J. W. Grant (*British Tabulating Machine Company*) gave a general outline of the plans to use a HEC 4 at Letchworth for production control. Mr. C. A. Wilkes (*I.C.I. Dyestuffs*) is using the pioneer PEGASUS data processing system with separate converter equipment to produce more rapidly the sales statistics previously prepared on tabulators.

This final paper was presented when many of the delegates had already sat through over 11 hours' presentation of a score of papers in 2½ days. The implications of the computer in the field of classificatory statistics was only touched-on in the time available, whereas this logical extension of the true *metier* of the punched card, in this paper and that of Mr. Wright, could have more usefully had a whole session to itself, preferably much earlier in the programme.

Among the general survey papers, Mr. Merriman's (*O & M Division, H.M. Treasury*) paper on computers ordered for Government work stressed the need for integration of O & M activities with the computer programmers, "to modify the ebullience of computer specialists, to check simpler alternatives, and to supervise changes." My colleague tonight Mr. D. W. Hooper (*National Coal Board*) presented, with representatives of other nationalised industries, a survey of installed capacity in that field. Mr. Furniss (*Imperial Chemical Industries*) reviewed the experience of his Company, which has so far done more than any other to stimulate the use of computers in Britain for data processing on the four machines already delivered. Mr. D. Wragge-Morley (*Financial Times*) surveyed service bureaux. In the ensuing discussion it was suggested that in Great Britain we had some way to go to catch up with the position in U.S.A. and on the continent of Europe, particularly in analogue computer service bureaux.

Our picture of the symposium would not be complete without a brief reference to the comments of the distinguished chairman of each session. These stressed in turn the human aspects requiring consultation, the importance of learning on the job with what was available (experience, not hardware, counts), the 80% load of work outside the computer, and the need to ask all the time "what do 'they' do with what we produce?"

I would like to congratulate the Committee on their comprehensive programme. But for Mr. Hooper and myself, as two of the five honorary editors of your publications, this symposium has left something of a vacuum of original papers for some little while to come! Why was it necessary to have a cocktail of papers in each session, instead of specialising?

*Mr. D. W. Hooper:* I agree that there is much to be said for arranging a Symposium by grouping related matters so that each session follows a main theme. But we must remember the original plan for this Symposium: to show "business" people what *could* be done, by illustrating what *had* been done. Each session was therefore deliberately a cross-section of experience in differing fields and on differing equipment, since it was considered that many people, particularly those not yet fully immersed, would only wish or only have time to attend one or two sessions, and this wider view in each session would present a better overall picture of computer effort.

The other point to which I must refer is Mr. Gearing's criticism of those authors who had not done their own programming. I agree wholeheartedly with him that it is only by doing one's own programming that one is able to appreciate the potentialities of the machine and the complexities of the problem, and to achieve an optimum solution.

But we must not forget that the computing art burst on the business world as a sudden event. On the outbreak of war many of those mobilised to develop a particular function had to rely on their specialists; many an officer faced with the responsibility of large-scale vehicle movement had never had to compile a convoy programme. The authors of the papers in many cases, similarly, were those responsible for development rather than specialist programmers. But, and here I agree with Mr. Gearing's general point, they will have to learn something about programming before they can initiate more sophisticated development of their machines.

I gained the further impression from some of the questions and answers that in a few cases the organisations had no programmers of their own and relied on others to do their programming (normally the manufacturer of the machine). In certain circumstances this may be defended in the initial stages. They have had to make use of the machine in the

PRINCIPAL EXHIBITS

| | *Working* | *Major Assemblies on Show* |
|---|---|---|
| Types of Digital Computers:— | | |
| In Exhibition | 12 | 5 |
| Available for calculations | 3 | — |
| Shown as models | — | 8 |
| Types of Electronic Calculators | 3 | — |
| Types of Input devices | 23 | 12 |
| Types of Output devices | 19 | 3 |
| Types of Magnetic Tape Units | 4 | 8 |
| Types of Magnetic Drums | 12 | 3 |
| Types of Analogue Computers | 8 | 1 |
| Types of Communication Equipment | 3 | — |

shortest possible time after they were able to get at it; the first application has in many cases been an existing procedure, and often one which was "orthodox" to the extent that it was fairly common to every user in many aspects (such as payroll); it involved no great knowledge of the particular circumstances of the user's industrial processes or management techniques; it was one which the manufacturers themselves had probably been demonstrating when they sold the machine. It was therefore convenient, and an economic sop to management, to use initially the programming resources of the manufacturer.

As a last general comment on the Symposium, I found it disturbing to read in a number of papers that the organisation of the application had taken longer than anticipated, that the difficulties inherent in installing a computer had been underestimated, or that it had been necessary to amend the original proposals to allow for more ancillary machines or even human bodies. One would have hoped that by now American experience would have been taken to heart and the lessons of incomplete planning absorbed. One feels that had John Diebold been present at the Symposium he would have had every reason to exclaim "I told you so!"

It was also clear from many of the papers that full benefits can only come when equipment, particularly in relation to input and output, has been developed to match the efficiency of the computing heart of a data processing system. It is difficult to feel assured that a system is a truly integrated one when, as in a surprisingly large number of the papers, it is revealed that input is prepared by manual punching, sometimes even from forms specially prepared and checked to make the task of the punch operators easier, and that output printing, so often a heavy task in commercial applications, necessitates translation from tape to card and thence to printer, or even character by character printing from tape.

The answers to these problems did not lie in any of the Symposium papers (except to the extent that hardware itself was described), but was shown on the floor of the Computer Exhibition. Here, one most significant fact was the development in input and output equipment, clearly in an all-out effort to catch up the development of the computers themselves.

A pre-view of some of the principal exhibits was given in *The Computer Bulletin* (Vol. II, No. 4); tonight we will attempt to review the important developments and to summarise the exhibition as a whole.

## *THE COMPUTER EXHIBITION*

*Mr. H. W. Gearing:* Forty-one manufacturers exhibited equipment. The variety of the equipment is summarised in the Table above, in which no type of equipment is counted twice on the same line, even if exhibited several times and on more than one stand.

The three computers available for calculations and demonstration were the LEO I and LEO II at Cadby Hall and Elms House near Olympia, and one of the DEUCES at Stafford connected by TRANSCEIVER link. *Powers* and *English Electric* showed illuminated models with explanatory commentary on closed circuit telephones.

There were however no less than twelve digital computers working at Olympia. These included the ELLIOTT 802, part of the EMIDEC 1100 and the METROVICK 950. The attachment of new forms of input and output, and magnetic tape supplementary storage, has turned the popular scientific computers PEGASUS and DEUCE into data processing systems. LEO and the ELLIOTT 405 systems are also being extended. The more advanced business machines of the "second generation" (e.g. EMIDEC 2400, HOLLERITH 1400 and PERSEUS) were publicised by means of literature and models but very little hardware was shown.

A most impressive aspect of the exhibition was the development of ancillary equipment. In most cases the progress in this field could be described as steady rather than spectacular, with one or two exceptions (e.g. *Creed* and *Xeronic*).

Time-sharing in computers, about which a fair amount has been written and talked, was not confined to the IBM RAMAC; *Elliott Brothers*, who are now apparently marketing all of their digital computer equipment through *N.C.R.*, exhibited their new 802 desk-size digital computer, with three output channels. This concept was also demonstrated in another way by the DEUCE computer. The TRANSCEIVER link sent a mixture of five simple questions to Stafford and answers came back almost immediately.

On the *Ferranti* stand there were exhibited some forty photographs of installations already completed and a number of other manufacturers also showed photographs of their completed installations. These displays and the equipment

on show must have done a great deal to demonstrate to overseas visitors that we have a well-established electronic computer industry in this country.

It was, I understand, a decision of the Committee that only those overseas manufacturers with factories or selling organisations in this country could exhibit, and this in my view had one slightly unfortunate consequence. On various stands we saw specimens of the excellent equipment produced by the French punched-card *Compagnie des Machines Bull.* As the representative of a user, I feel that it would have been of great interest to have had a more complete display of their equipment. We might also have had more American equipment for comparison.

### *Data Preparation*

Accounting machines with punched-paper tape output were exhibited by *National*, *Burroughs*, *Bulmers* (*Addo* and *Friden*), *Logabax* and *British Olivetti*, while *London Office Machines* showed SWEDA cash registers with punched-tape output for co-operative societies, etc.

Character recognition equipment exhibited showed two lines of development:—

(*a*) The *Solartron* ERA prototype was apparently too bulky to move from Dorking but the prototype roll-reader developed for *Boots Pure Drug Co. Ltd.* showed signs of having overcome one major paper feeding problem; it is claimed that when fully developed this equipment will read 300 characters per second.

(*b*) *E.M.I.* showed prototype equipment for reading figures, which had been specially designed to give different wave-forms when scanned by photo-electric equipment.

*Burroughs* gave brief details in a film of their work on magnetic ink in U.S.A. *National* exhibited their POSTRONIC accounting machine with a magnetic record on each account of brought-forward balances. The *Ferranti* stand received data from *Burroughs* and *Creed* over wire.

### *Input Equipment*

The *Powers* card reader and control cabinet for PLUTO and PEGASUS 2 was exhibited; the electronics are under development at Whyteleafe.

*Elliott* will manufacture a new 1000 character per second paper-tape reader, developed at Cambridge Mathematical Laboratory; the prototype was demonstrated feeding tape at high speed and stopping within the space of one character. *Metropolitan Vickers* have developed a tape reader. *Ferranti* showed their TR5 (300 characters per second) and TR7 (1,000 characters per second).

Ferranti also showed the TRANSACTOR (a marked-card reader) which is at present used for input to the reservation system supplied to *TransCanada Airlines* by their Canadian associates, *Ferranti-Packard Electric* of Toronto. There were several *Elliott* card readers, two connected to computers. IBM TRANSCEIVERS for sending punched card information over telephone lines were demonstrated on the *English Electric* and *IBM* stands.

### *Storage Devices*

*Mr. D. W. Hooper:* An important item of hardware for commercial applications (and in some more than others) is storage capacity, whether in the form of magnetic storage drums or magnetic tape units.

Of the former, there were six large drums stores shown: *Sperry Gyroscope* drum (4,000 words), designed for continuous operation and requiring limited maintenance at three yearly intervals; *Ferranti* MERCURY drum (8,192 words); *E.M.I.* 1100 drum (8,000 words); *British Tabulating* file drum (2,100,000 characters); *I.B.M.* RAMAC (5,000,000 digits); and *M.V.E.* 1010 drum (60,000 words), shown as a model.

It is difficult for the potential commercial or office user to grasp a display of hardware, particularly when, as with magnetic drums, nothing appears to be happening. But it is the large file drum or similar drum storage device with reasonably fast random access that accountants, particularly, seem to think will give them a facility, otherwise lacking in an electronic data processing system, to ask the computer a question, to interrogate it as to the current state of some information held within it, and to update it periodically as new data flows in.

This has an irresistible attraction to those whose concept of any business application is the conventional one that there must always be some means of knowing the state of any account at any chosen moment in time. This concept was demonstrated by *IBM*, whose RAMAC was in continuous operation as an integral part of the *IBM* 305 Random Access Method of Accounting and Control, processing customers' orders, invoicing, maintaining stock records, etc., for a hypothetical electrical wholesaler. The equipment had been shown at Brussels Fair and subsequently at exhibitions in Milan and Rome. Like most other equipment at Olympia, it was being flogged mercilessly.

A notable omission was any demonstration of a large ferrite core storage for a digital computer. Certainly one well-known manufacturer who has working prototypes of such a device apparently decided not to show his latest machine—perhaps because he has to sell the current production model first!

### *Magnetic Tape Systems*

At least eight magnetic tape systems were exhibited for digital recording, in addition to those for analogue recording: *EMI* 1 in. tape on three units; *EMI* 4 in. tape on one unit; six *IBM* units linked to a 650 computer; *Decca* tape unit (on the *British Tabulating* stand); *Electrodata-Ferranti* four unit system linked to a PEGASUS; *Standard Telephones and Cables* large loop system sending signals to a *Rank-Xeronic* printer; four *Elliott* film mechanisms on a 405 computer and one on converter equipment; and an AMPEX tape unit on the *EMI* stand.

Each of these systems claims some unique advantage; the manufacturers would not be human if they did not. Development chiefly seems to be along the lines of improved transport mechanisms with faster start/stop times, higher packing density (with, as a necessary corollary, improved tape) and better reel or magazine changing devices.

### *Output Equipment*

It is an interesting comment on current progress in the data processing field that developments in electronics have demanded developments in mechanical engineering techniques, a trend most clearly demonstrated in output mechanisms. It is little use having a device to imprint on paper at several thousand lines a minute if it is not possible to control the paper movement with sufficient accuracy at such high speeds.

The most significant advances in output printing equipment, were the *Xeronic* line printer, the *Creed* Model 1000 character printer, and *National Cash Register's* demonstration of direct printing from magnetic film.

The *Xeronic* printer was demonstrated at 1,500 lines per minute, but this will later be raised to 3,000. It is also intended that an optical device will simultaneously project, independently of the digital information, an image of the required form design, so that both form and contents can be printed simultaneously.

The *Creed* Model 1000 printer (still experimental) is based on the principle of a wire matrix forming each character as it travels across the paper (as in their model 75 teleprinter) and will operate at 100 characters per second. This increase in speed of twelve times that of their Model 75 goes some way to removing current limitations on perforated tape as computer output; its main field would seem to lie in the quicker preparation of reports for management rather than in the production of a large number of forms.

The *N.C.R.* equipment consisted of a converter linked directly to a Bull printer (to be superseded by an *N.C.R.* printer which will operate at 600 lines a minute).

Time does not permit me to cover all the other items of ancillary output equipment. *Creed* perforators and *Samastronic* printers were linked to more than one manufacturer's computers, and there are significant signs of much greater flexibility in the composition of a data processing system.

*Miscellaneous*

With these developments in printing output one must link, as I have said, development in paper handling. *Fanfold*, *Lamson Paragon*, *Egry* and *Percy Boyden* all demonstrated sprocket-fed stationery devices for printers and tabulators. They also showed devices for dealing with the paper spewed forth from high speed printers. I searched in vain for an equally fast mechanical device to receive perforated tape, but it seems that the waste-paper bin is still the best receiving hopper.

Allied to this demonstration of computers and ancillary equipment there were naturally exhibits of components and testing equipment, periodicals, and even membership forms for the British Computer Society. In all, a most comprehensive view of the state of the British computer industry. Six days before the Exhibition opened, the National Hall at Olympia was bare of all equipment, with only dust on its concrete floor. In these six days, the exhibitors moved in some £8,000,000 worth of equipment (said to have comprised the greatest value per square foot of any exhibition held at Olympia), set up this equipment, tested it and had it running for the opening; it was a remarkable achievement in organisation and demonstrated very clearly what the industry could do if really pushed.

## *CONCLUSION*

Was the Exhibition a success? As a demonstration of a flourishing industry, of Britain's ability to design and manufacture equipment equal to any produced elsewhere, my answer must be "yes." As a trade exhibition, judged solely on the number of entries in manufacturers' order books, only they can tell us; I am sure in the long term the answer will also be "yes." Attendance exceeded all expectations, and the interest shown in the exhibits by so many people with, in many cases, only a potential interest in computers must help to make the machines more acceptable generally.

Further, such an exhibition is of use in giving the research worker, the designer and the manufacturer a deadline by which to produce a machine which works; it forces new development and modification of prototypes to stop momentarily at a point in time so that production can start. To the manufacturers who had sufficient faith in the project to finance it, we must express our thanks for an educational occasion seldom paralleled in this country.

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*CORRESPONDENCE (Continued)*

## *Simple English*

Sir,

I beg your support for a plea that those who write about the use of computers should do so in simple English. I pick two items from papers at the Computor [*sic*] Symposium to show why I make the plea.

One writer says:

"There are savings which it is not practicable to quantize at the preliminary stage."

If he meant "quantity" or "evaluate" he would have used one of those words. "Quantize" is not in my Shorter Oxford English Dictionary so that it is not easy to guess what shade of meaning he sought. Did he intend to leave the point obscure?

Typical of another writer is the paragraph:

"Differentiation and specialization of function, with consequent departmentalization—so characteristic of modern industry—were perhaps inevitable and for many purposes advantageous. Such departmentalization did, nevertheless, lead to the creation and maintaining of separate, individual departmental records each framed to present information in a form regarded as most suitable for departmental purposes. This multiplication of records, all substantially relating to the same things but each embodying some part of the information relative thereto and each expressed in a different "language" has created in some undertakings a veritable Tower of Babel wherein communication becomes increasingly more difficult."

The idea is almost drowned in this sea of long (should I say "multisyllabic") words. Is it fair to expect us to sift such a mass to find so small a gem?

The use of made-up words, jargon, and verbiage is not the way to attract those who should be interested in computers.

Yours, etc.,

*Chipstead, Surrey* SIDNEY JACKSON

# LONDON MEETINGS

## *Opening Meeting*

The first meeting of the 1958–59 session was held in the Great Hall of Northampton College of Advanced Technology on 16 October, with the President, Dr. M. V. Wilkes, in the chair. The address was given by the Rt. Hon. the Earl of Halsbury, Managing Director of the National Research Development Corporation, on "Ten Years of Computer Development."

Reviewing the rapid development of computers, Lord Halsbury dealt in particular with the machines which N.R.D.C. had sponsored, and were continuing to encourage. His address will be published in *The Computer Journal.*

## *IBM 650 Experience*

There was a large attendance of members at the Rudolf Steiner Theatre on 1 October to hear Mr. C. W. Adams of the Creole Petroleum Company give the first talk in the series of additional meetings on business applications. Mr. Adams first gave a general picture of the company's activities in Venezuela, and of the country itself. With the main operations spread over several centres, and bad communications, the company decided to rent three IBM 650 magnetic tape systems at different points, rather than to have a single, central installation.

With considerable experience of mechanised systems on conventional machines, it was arranged that these would be taken over by the computers before exploring new applications. The current work being done on the 650's covers:

(*a*) payroll: there is a pilot program for 1,100 people, which takes six hours to run; the program took 18 man months to write; it is planned to extend this to process another 8,000 employees,

(*b*) general accounting: they had not found the 650 very suitable for this owing to the large volume of output,

(*c*) material accounting and control: the stock accounting had been programmed but automatic notification of re-ordering requirements had yet to be done,

(*d*) statistics relating to the sales of refined petrol in Venezuela,

(*e*) personnel statistics.

(*f*) linear programming: many programs had already been written for problems peculiar to oil refining by the Standard Oil Company of New Jersey (an affiliated concern); these programs can be used almost unchanged.

Two further possible applications now being studied are to maintain records of output and operating data for individual wells, and to produce statistics on various types of underwater equipment. Many wells are sited in lakes, giving rise to particular problems of corrosion.

Mr. Adams gave an interesting account of some of the difficulties of operating computer systems in Venezuela; few Venezuelans make satisfactory operators even if they were previously employed on orthodox mechanical equipment; none have so far become programmers, all 15 being American; communications are uncertain and the use of an IBM transceiver is contemplated.

## *Analogue Computers*

The Society's first serious venture into the field of analogue computers was undertaken on 9 October when Mr. G. Tootill of the Royal Aircraft Establishment, Farnborough, gave what he described as an introductory talk on "The Incremental Digital Computer." He first gave some reasons for the importance of analogue computers especially in the field of simulation. He said that they represented a mode of operation and a method of action which satisfied engineers especially when they were speculating about a problem. Unlike simulation trials on a digital computer there was a close analogy between the true situation being investigated and the analogue simulator; this gave the operator considerably more scope to handle the variables in the system. Furthermore, there was a prospect that the analogue machine could work on a real time scale although at present this was not often attained. The disadvantage with earlier analogue machines was the accuracy of the basic units employed and, although techniques have improved to the point where unit errors of about ·01% are claimed, this could still be a limiting factor if a large number of these are required to solve a problem.

To overcome this limitation digital computing techniques have been adopted and the basic unit he described was a device which performs approximate integration by finite differences. This it does by accepting as inputs $\Delta x$ and $\Delta y$, then $\Delta y$ is first added to $y$ (which is the sum of all previous $\Delta y$ inputs) and $\Delta z$ is formed which equals $y\Delta x$ on average. To simplify the multiplication $\Delta x$ was constrained to take the values $+1$, $0$, $-1$, and the output $\Delta z$ was also constrained to the same range. These ternary increments require two wires for transmission and so there is some saving if the binary increments are used, that is the $\Delta$'s only take the values $+1$ or $-1$.

When in use these integrators are linked together, with the outputs of some serving as inputs of other units. Differential equations can be solved by correctly interconnecting a number of these units. It is possible to economise on the number of units required by having a common computing circuit which can be used in turn by all integrators combined in a special store. These registers can then be called up as required and the operation of this system is not unlike that of a digital computer.

# REGIONAL BRANCH NEWS

## BIRMINGHAM

The 1958–59 lecture programme began on 2 October with a Presidential Address by Dr. M. V. Wilkes, F.R.S., entitled "The Development of Digital Computers."

In his talk Dr. Wilkes pointed out the increased speed and storage capacity available in the "second generation" of digital computers, compared with the facilities of the first experimental machines, and explained how the scope of digital computer applications consequently increased.

He also pointed out the importance of parallel programming or "break-in" operation as a method of using a very high speed computer economically, in conjunction with much slower peripheral equipment such as printers.

The major engineering change now in progress was the increased use of transistors in digital computers, and Dr. Wilkes anticipated that greater intrinsic reliability would be obtained from transistorized computers.

Study Groups have been formed to discuss Input and Output, Production and Stock Control, General Accounting, and Operations Research, and meetings will start this month.

## LEICESTER

The first 1958–59 meeting of the Branch took place on 24 September at the Leicester College of Technology and Commerce, when Mr. W. J. Kease of the Computer Division, E.M.I., gave members a talk on the EMIDEC Computer. His lecture proved extremely interesting and the time for questions and discussion all too short.

The second meeting took place on 29 October, again at the College. Mr. G. D. Royle, of English Electric Co. Ltd., and Vice-Chairman of the Manchester Branch of the Society, discussed the installation and maintenance of the DEUCE. This lecture was more technical than the first but, with the use of some excellent 35 mm. slides, was lucidly delivered. The audience appreciated the frankness with which the difficulties besetting the engineer were described and the speaker in answer to questions, offered some very useful suggestions on adequate acceptance tests.

## LIVERPOOL

At the Inaugural Meeting of the Liverpool, Merseyside and District Branch of the Society over 300 people were welcomed by Professor L. Rosenhead, C.B.E., Ph.D., D.Sc., F.R.S., who was elected President of the Branch.

The motion for the formation of the branch was duly passed, and after the committee had been elected Professor Rosenhead introduced Mr. A. J. Barnard of Norwich who addressed the meeting on the subject of "Book-keeping by Computer." Mr. Barnard based his talk on his experiences at Norwich and those present enjoyed a most informative address.

The following members have been subsequently appointed:

*Chairman:* Mr. Andrew Young.
*Hon. Secretary:* Mr. A. J. Platt.
*Hon. Treasurer:* Mr. J. C. McGregor, F.C.A.

On Wednesday 29 October the branch was addressed by Dr. A. S. Douglas, Director of the University of Leeds Electronic Computer Laboratory on the subject of "Computer Techniques for Processing Data." Dr. Douglas dwelt particularly on the various methods of re-arranging, sorting and merging information which had to be fed into the computer. The 31 members and 12 guests present heard a most instructive talk.

On 25 November the branch was addressed by Mr. H. E. C. Nash of Littlewoods Mail Order Stores Ltd. on "Bread and Butter Jobs on a Computer." Despite fog, 35 members and guests were present. Mr. Nash described how the stock of a chain of stores was being controlled by a NATIONAL-ELLIOTT 405 computer installation. He indicated how management was being helped to plan buying policy and how stores managers were being relieved of a large volume of stores accounting.

# AUTOMATION IN THE POST OFFICE

## *New Pattern in Staff Consultation*

Aware of the difficulties which the introduction of automation has caused in some industries, the Post Office has set what it believes to be a new pattern in staff consultation. With the impending introduction of electronic computers to calculate a payroll of some 112,000 staff in the London area, staff representatives and their official colleagues were brought together at special training courses to give them an appreciation of the use of the computers. The computers will be installed at a central unit known as LEAPS (London Electronic Agency for Pay and Statistics) and are expected to begin working in early 1959, although it may take three years to convert wholly to the new system.

Much staff consultation is necessary before large-scale changes of this kind are applied. A joint LEAPS Committee, consisting of both officials and trade unionists, has already been set up to discuss the human and operational aspects of the project. This Committee, as a whole, attended the first appreciation course.

The courses, each lasting three days, are being held in conjunction with the computer manufacturer, and give a broad appreciation of the principles of computers and an outline of how they work. A full explanation is given of the preparatory work necessary before computers are installed and how they are applied in particular to payroll work. Part of one afternoon is devoted to a conducted visit to a computer installation, where members of the course are able to see the equipment in

operation. Each course ends with a brains trust, at which course students are encouraged to ask any questions which occur to them, and a team of experts give frank answers.

Five courses in a series have already been run; a sixth is to take place in early November. One hundred and seventy people, divided equally between officials and staff representatives will by then have attended. Shorter courses will be held later to meet the needs of many other staff affected by the introduction of these computers.

## *Data Transmission*

For some time now the Post Office has been receiving enquiries about line transmission facilities available for use with automatic data processing machinery. In order to answer some of these enquiries they have prepared a booklet entitled "Facilities for Data Transmission."

This booklet is intended as a general guide to the services available at present. On the one hand they can supply a range of line facilities and a number of standard telegraph machines; on the other they can advise on the technical requirements for line transmission which may need to be taken into account in the design of computer equipment.

The Post Office is anxious to co-operate, so far as their resources allow, and to keep abreast of events so that new facilities can be developed as necessary. They intend making further enquiries, in due course, to business and industry generally about future data transmission requirements.

## *Stock Control*

The Post Office have recently installed a computer (HEC4) in their Supplies Department to augment and develop the work of the existing punched card installations. The computer is being used particularly for the production of statements of stock, assets and transaction analyses in respect of telecommunications and allied stores. The program itself incorporates much of the routine calculation work hitherto carried out by the provisioning clerks when deciding the quantity of stores to be obtained to meet the calculated demand.

They are anxious to contact any organisations now using computers for comparable work, or likely to be in the future. Any information sent to the Editors of *The Computer Bulletin* will be forwarded to our correspondent.

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# THE NATIONAL PHYSICAL LABORATORY'S ACE

## *Introduction*

The Automatic Computing Engine or ACE is the latest digital computing machine to be built at the National Physical Laboratory for the use of its Mathematics Division. This new machine with its increased operating speed, its larger storage capacity and its many additional functional facilities is a considerable advance as a computing tool on its predecessors, the experimental Pilot Model ACE and its engineered counterpart DEUCE.

## *Speed*

It is not easy to assess the speed of a machine from the times taken by the elementary arithmetic and logical operations. This is particularly true of any machine with high speed stores of less than about 8,000 words on which many problems will demand the use of the backing-up store. The times taken for a few basic computations probably give as accurate a picture of the overall speed as can be obtained without a detailed study.

(1) The zeros of a 16th degree polynomial may be obtained in an average time of 15 seconds. Because of the long word length (48 digits), accurate roots even of very ill-conditioned polynomials of this degree will be obtained. Polynomials of degrees up to about 250 may be found without using the drum store, though no sharp discontinuity in speed results from using the drum on this problem.

(2) A set of simultaneous equations of order 30 can be solved in about 5 seconds. Sets containing no zero coefficients of orders up to 170 may be solved, the time taken varying approximately as the cube of the order but diminishing as n becomes large.

(3) The solution of Poisson's equation, $\nabla^2 V = 4\pi\rho$ on a square with 400 mesh points, may be obtained in about 75 seconds. This time is for the direct solution of the finite difference equations and will give values correct to at least 10 decimals. After solving one such problem, solutions corresponding to different distributions of $\rho$ may be obtained in about 15–20 seconds each.

## *Short Description of Machine*

ACE is a serial computer in which numbers and instructions have 48 binary digits: the digit rate is 1·5 million per second and therefore its word time or minor cycle is 32 microseconds.

The main working store consists of 24 mercury delay lines each containing 32 words, circulating in a major cycle of 1,024 microseconds. Rapid access storage is obtained by using mercury delay lines of one, two and four words capacity. The backing store is four magnetic drums containing a total of 32,768 words.

Punched card and magnetic tape equipment will be provided for input and output. The installation will initially consist of two machines:

a broadside card reader, running at 450 cards per minute, and

a broadside card punch running at 100 cards per minute.

In order to read or punch 80 columns of a card the computer has an 80 digit input dynamiciser and an 80 digit output staticiser.

The ACE has been designed and constructed to allow easy maintenance. Extensive marginal checking facilities are provided and the chassis units are designed to give complete accessibility to all components, valve connections, etc.

The machine is housed in 10 cabinets, each having a cooled air circulation system. Each cabinet is fitted with a rising door which permits immediate access to all the 24 chassis units contained therein. The number of valve envelopes is about 6,000.

# SOME APPLICATIONS OF DEUCE

## *Atomic Energy Research and Engineering*

Amongst the papers presented at the recent Geneva Conference on the peaceful uses of atomic energy was a Monte Carlo study of thermal utilisation factors and diffusion areas for gas-cooled graphite-moderated lattices carried out by the Atomic Power Division of the English Electric Company Limited.

The first part of the work described in this paper consisted of an attempt to explain the experimental data relating to thermal flux fine structure in gas cooled graphite moderated uranium lattices. This was done by solving the one-energy-group transport equation by the Monte Carlo method, using fundamental cross sections. A survey covering a wide range of reactor parameters was made, and the results were found to be in good agreement with experiment.

The second part consisted of the evaluation by the Monte Carlo method of macroscopic diffusion areas. The results for empty channels were compared with experiment and found to be in good agreement. For channels containing fuel, however, the results indicate that the diffusion areas calculated by the usual (Behrens) theory are only approximate.

All the calculations involved in this work were carried out on an English Electric DEUCE.

Monte Carlo calculations constitute of course, only a part of the calculations needed in atomic power applications. DEUCE is being applied to most aspects of such calculations, not only by the English Electric Company (in e.g. the design of the 500 MW Hinkley Point Nuclear Power Station) but by the UKAEA at Harwell and Aldermaston and by the CEGB.

Another interesting application in the atomic power field to which DEUCE will shortly be put is in the control of the UKAEA diffusion plant at Capenhurst. This plant produces almost pure $U_{235}$ by the gaseous diffusion process. A DEUCE will shortly be installed at Capenhurst to control this process, and to indicate optimum production schedules. It will also be used for research work connected with the plant.

* * *

## *An Automatic Coding Scheme*

One of the objections which have in the past been levelled at machines, such as DEUCE, which are capable of optimum programming, is the labour involved in coding. Optimum coding is, however, obviously a process which can be made at least semi-automatic and is hence something which a computer can do for itself.

The finishing touches are now being put to such an automatic coding scheme for DEUCE. This arranges for a partially optimised fully coded version of the program to be produced from the basic flow diagrams by DEUCE itself.

It is hoped to publish details of this scheme in a subsequent issue of *The Computer Bulletin*.

It should be added that this scheme is only one of several DEUCE schemes, either in existence or in preparation, whose object is to reduce to a minimum the effort involved in programming.

* * *

## *The Cost Optimisation of Air-Cooled Condensing Plant*

A program has recently been prepared for the DEUCE Computer for the cost optimisation of air-cooled condensing plant such as has been developed for large scale use by the Steam Turbine Division of the English Electric Company.

Condensers of this type have the advantage, over the conventional type of condenser used in steam turbine plant, of involving a closed system, so that water evaporation is negligible. Hence once the process is going, very little make-up water is required, and so the usual problem of having to site steam turbine plant near a plentiful supply of water is obviated.

The cost optimisation of a new full scale system such as this obviously raises considerable difficulties. An exhaustive analysis of this problem has been carried out by the English Electric Company and the heavy calculations resulting have been programmed for DEUCE. This allows rapid and accurate design optimisation with respect to both capital and running costs.

# ZURICH CONFERENCE ON ALGORITHMIC LANGUAGE

*Arising out of the recent growth of interest in automatic coding methods for digital computers the suggestion has frequently been made that we should attempt to arrive at an agreed set of conventions that could be used in programming a variety of problems for many different computers. Last year a meeting was held in Zurich of a committee set up by The Association for Computing Machinery (ACM) and The German Association for Applied Mathematics and Mechanics (GAMM) with the aim of formulating proposals for a common programming language. By courtesy of that committee we print below the introductory part of the report which they issued. A few copies of the complete report are available and may be borrowed from Dr. S. Gill of Ferranti Ltd., 21 Portland Place, London, W.1.*

*The British Computer Society has also set up a committee to investigate this subject. This committee has been reviewing the work of the ACM-GAMM committee and hopes to publish in due course proposals which it hopes will find general support for the establishment of conventions in programming language.*

In 1955, as a result of the Darmstadt meeting on electronic computers, GAMM set up a committee on programming (Programmierungsausschuss). Later a sub-committee began to work on formula translation and on the construction of a translator, and a considerable amount of work was done in this direction.

By October 1957 the GAMM group, aware of the existence of many programming languages, concluded that rather than present still another formula language, an effort should be made toward unification. Consequently, on 19 October 1957, a letter was written to Professor John W. Carr III, president of ACM. The letter suggested that a joint conference of representatives of GAMM and ACM be held in order to fix upon a common formula language in the form of a recommendation.

An ACM *ad-hoc* committee was then established by Dr. Carr, which represented computer users, computer manufacturers, and universities. This committee held three meetings starting on 24 January 1958 and discussed many technical details of programming language. The language that evolved from these meetings was oriented more toward problem language than toward computer language and was based on several existing programming systems. On 18 April 1958 the committee appointed a sub-committee to prepare a report giving the technical specifications of a proposed language.

A comparison of the ACM committee proposal with a similar proposal prepared by the GAMM group (presented at the above-mentioned ACM *ad-hoc* committee meeting of 18 April 1958) indicated many common features. Indeed the GAMM group had planned on its own initiative to use English words wherever needed. The GAMM proposal represented a great deal of work in its planning and the proposed language was expected to find wide acceptance. On the other hand, the ACM proposal was based on experience with several successful, working, problem oriented languages. Both the GAMM and ACM committees felt that because of the similarities of their proposals there was an excellent opportunity for arriving at a unified language. They felt that a joint working session would be very profitable and accordingly arranged for a conference in Switzerland to be attended by four members from the GAMM group and four members from the ACM committee. The meeting was held in Zurich, Switzerland, from 27 May to 2 June 1958, and was attended by F. L. Bauer, H. Bottenbruch, H. Rutishauser and K. Samelson from the GAMM committee and by J. Backus, C. Katz, A. J. Perlis and J. H. Wegstein from the ACM committee.

It was agreed that the contents of the two proposals should form the agenda of the meeting, and the following objectives were agreed upon:

I. The new language should be as close as possible to standard mathematical notation and be readable with little further explanation.

II. It should be possible to use it for the description of computing processes in publications.

III. The new language should be mechanically translatable into machine programs.

There are certain differences between the language used in publications and a language directly usable by a computer. Indeed, there are many differences between the sets of characters usable by various computers. Therefore, it was decided to focus attention on three different levels of language, namely a *Reference Language*, a *Publication Language*, and several *Hardware Representations*.

*Reference Language*

1. It is the working language of this committee.
2. It is the defining language.
3. It has only one unique set of characters.
4. The characters are determined by ease of mutual understanding and not by any computer limitations, coders' notation, or pure mathematical notation.
5. It is the basic reference and guide for compiler builders.
6. It is the guide for all hardware representations.
7. *It will not normally be used for stating problems.*
8. It is the guide for transliterating from publication language to any locally appropriate hardware representations.
9. The main publication of the common language itself will use the reference representation.

All objects defined within the reference language are represented by a given set of symbols. It is only in the use of symbols that the publication languages and hardware languages may differ from the reference language, whereas structure and content should be the same for all languages.

The purpose of the language is to describe computational processes. The basic concept used for the description of calculating rules is the well-known arithmetic expression containing the equally well-known constituent numbers, variables, and functions. From such expressions are compounded, by applying rules of arithmetic composition, self-contained units of the language, explicit formulae, called arithmetic statements.

To show the flow of larger computational processes, certain non-arithmetic statements are added which may, for example, describe alternatives or recursive repetitions of computing statements.

Statements may be supported by declarations which give no operating rules, but inform about certain properties of objects appearing in statements, such as the class of numbers to be represented by a variable, the dimension of an array of numbers, or the set of rules defining a function.

Sequences of statements and declarations are called programs. However, whereas complete and rigid formal rules for constructing statements are described in this report, no such rules can be given in the case of programs. Consequently, the notion of program must be considered to be informal and intuitive, and the question whether a sequence of statements may be called a program should be decided on the basis of the operational meaning of the sequence.

*Publication Language*

1. The description of this language is in the form of permissible variations of the reference language (e.g. subscripts, spaces, exponents, Greek letters) according to usage of printing and handwriting.
2. It is used for stating and communicating problems.
3. The characters to be used may be different in different countries but univocal correspondence with reference representation must be secured.

*Hardware Representations*

1. Each one of these is a condensation of the reference language enforced by the limited number of characters on standard input equipment.
2. Each one of these uses the character set of a particular computer and is the language accepted by a translator for that computer.
3. Each one of these must be accompanied by a special set of rules for transliterating from the publication language.

# BOOK REVIEWS

## *Notes on Analog-Digital Conversion Techniques*

Edited by Alfred K. Susskind, 1958; 420 pages. (New York, published jointly by *The Technology Press of Massachusetts Institute of Technology* and *John Wiley & Sons Inc.*, 80s. 0d.)

The text is based on a course of lectures by MIT staff presenting "to systems and design engineers an orderly survey of the theory and design of analog-digital conversion devices" but is also "intended to be suitable for readers who have been away from formal academic work for some time and who have little previous knowledge of the field." Selection of material must have been the authors' most difficult task and, although much of what is included is eminently of a practical nature, it is here that the book is most open to criticism. In particular more space might well have been devoted to the title theme and less to fringe topics. The chapter on digital circuits for example is scarcely appropriate, for in a bare 45 pages it cannot hope to cover such an enormous field. In fact, it does not even provide an adequate introduction since, of the many circuit diagrams included, not one contains a transistor. A whole chapter is devoted to detailing the basic design of a particular digital instrumentation system. It contains just such information as would readily be obtained by any competent engineer in the study phase of the project and is definitely out of place.

Despite the stated attempt to include every known basic analogue-digital conversion technique there are several important omissions. References to non-North-American sources are so conspicuous by their absence that one wonders if the authors have been aware of work undertaken elsewhere. The chapter on voltage coding and decoding makes no mention of the diode-resistor network for directly generating the Gray code nor does it deal at all with the coding of the amplitude of A.C. signals—an inherently accurate process in that reference voltages may be compounded precisely in proportion to the turns ratio on a transformer. Communications engineers will be disappointed to find no discussion of the methods of simplification practicable when the D.C. component of the voltage to be coded may be ignored. Chapter VI on position coders provides a more complete survey but the Moire fringe technique is barely mentioned and would surely have justified a page or two. Optical methods of position coding are dealt with in more detail in Chapter VIII, which includes some very useful data on light sources and detectors and a section on digital cameras which, although highly specialised, is interesting as an example of the ingenuity which frequently has to be applied to the design of equipment of this kind.

Of the fringe topics, Chapter II on sampling and quantising probably best justifies its place in the book since these functions are inseparable from digital encoding. The lesson that "sampling is *not* filtering but folding" is well rammed home but the section on the theory of sampling can do little more than make the reader aware of some of the mathematical techniques available. The weakest feature is the paucity of guidance on choosing the best sampling frequency and how closely the theoretical limit of 2 samples per cycle can be approached in view of such factors as the permissible reconstitution delay.

The reader using this book as an introduction to the subject will find some sections very readable, but the organisation and selection of material are such that he may find difficulty in extracting the essentials without searching through a bulk of detail. In spite of the criticisms, however, the book is valuable in presenting, as a co-ordinated whole, much that has hitherto not been available except in theses, reports and journals. It will be useful to all concerned with analogue-digital devices associated with computers, servo-systems and data transmission and reduction equipments.

R. H. BARKER

* * *

## *Scientific Programming in Business and Industry*

Andrew Vaszonyi, 1958; 474 + ix pages. (New York: John Wiley & Sons, Inc. London: Chapman & Hall Ltd., 108s. 0d.)

This book comes from the U.S.A. where our "programming" is called "coding," and the "programming" in the title means the planning of economic activities. More specifically, "Scientific Programming," in the words of the author, is "the allocation of limited means in order to reach specific goals in the best fashion." The most widely explored technique in this field, "Linear Programming," is by now well known in this country, too, and about half the book is devoted to this and related subjects (convex programming, theory of games); the remainder deals with dynamic programming, statistical inventory control, and problems of scheduling for assembly lines and machine shops.

The purpose of the book is to assist managers in the application of modern methods of mathematical economics to the efficient running of their undertakings though the reader whom the author has in mind is not so much the manager himself as rather his mathematically-minded assistant or consultant.

The only criticism that could be offered is that the emphasis on details of computational methods is perhaps overdone, and a reduction in the space devoted to the working out of examples would have left room for the treatment of a number of practical questions with which the reader is still faced after having mastered the manual solution of small-scale problems, such as: How large are the matrices encountered in practice likely to be? For what size of problems will electronic computers be (*a*) necessary, (*b*) possible, (*c*) economical? For what type of problems have programs for machines already been written, and in which fields has this still to be done? What size of firm is likely to profit from an application of these methods? How much work is involved in obtaining the data necessary to make the required calculations?

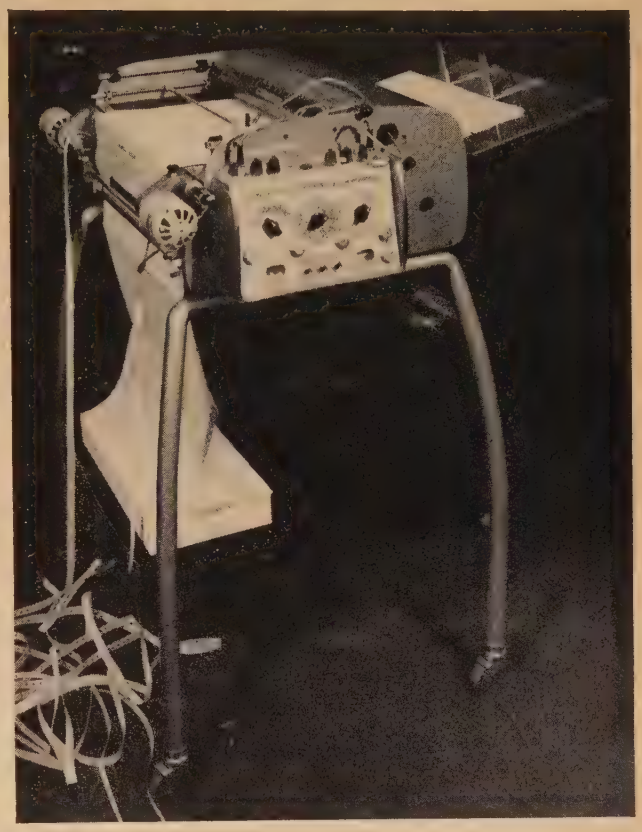
Some of these questions are, no doubt, difficult to answer at the present moment; but even a statement of our degree of ignorance would have been helpful. In any case, there is a large scope for the computer specialist in giving additional advice, and he, too, should read this book if only to get a better idea in what fields such advice may be needed by the business man.

The book is well printed, and the reviewer has found no errors apart from a few "duel problems" (pp. 155, 157, 159).

The reader with a sense of humour is urged not to miss the footnote on page 429.

D. G. PRINZ

# NEWS FROM MANUFACTURERS



## *Mathieu Guillotine*

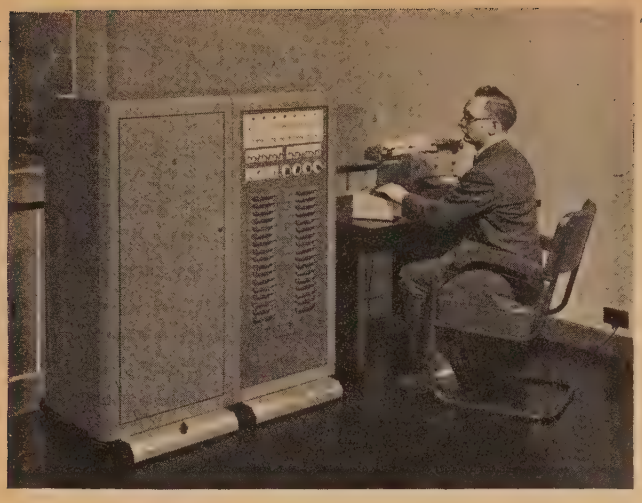
The MATHIEU machine, an electronic high-speed guillotine for separating continuous stationery from both reel or stacks, was shown at the Electronic Computer Exhibition.

The guillotine, which can accept forms up to 19½ in. wide, can separate them at a rate of up to 8,000 per hour, depending on length, which can be varied from a few inches up to 24 in. The required length is controlled by a built-in photocell. This control ensures that the cut is always made at the appropriate point, irrespective of slight variations in form lengths. Forms of irregular length can also be cut by setting the cell to a special trigger mark, heavy type or other sign.

A single MATHIEU guillotine can cope with the output of several electronic computers, tabulators and similar office machines; it was shown in this capacity on the *Powers-Samas* stand. The *Rank Precision Industries* computer output-printer on their stand printed, by the Xerographic method, on to reeled forms which were separated by the MATHIEU.

Various attachments also enable the MATHIEU, whose sales are handled by *A. J. Catlin Ltd., Jasper Road, London, S.E.*19, to carry out such operations as vertical ruling, vertical separation, decollation of multiple forms, overprinting and many others. Two edge trimmers are fitted as standard equipment.

* * *



## New Ferranti Computer

A transistor electronic digital computer designed to provide fully automatic control of many industrial processes is being developed by *Ferranti Ltd.* It is about the size of two small office filing cabinets and the first production models are expected to be available in 1960.

This will be the first time that a computer of this type designed for process control will use transistors instead of the conventional thermionic valve and, as a result, will only measure approximately 4 ft. × 4 ft. × 2 ft.

At present in the prototype stage, it is technically known as the PCTC (Process Control Transistor Computer). The transistor logical circuits in the computer have been thoroughly tested and an experimental model has controlled a machine which simulates a plant process for more than 2,000 hours operation without component failure.

The computer is being specifically developed as the centre unit in control systems for a variety of industrial processes, such as may be found in the power, chemical, oil, gas and steel industries. *Babcock & Wilcox Limited* and their associates *Bailey Meters & Controls Ltd.* are currently investigating with *Ferranti Ltd.* the feasibility of using this new computer for the control of boilers during start-up and shut-down.

Not only will this type of computer calculate alterations that have to be made in any process, but it will also provide the control signals to carry out these alterations automatically.

The price of the new computer will probably be in the range of £20,000–£50,000, depending on the size of the installation.

* * *

## National Cash Appointments

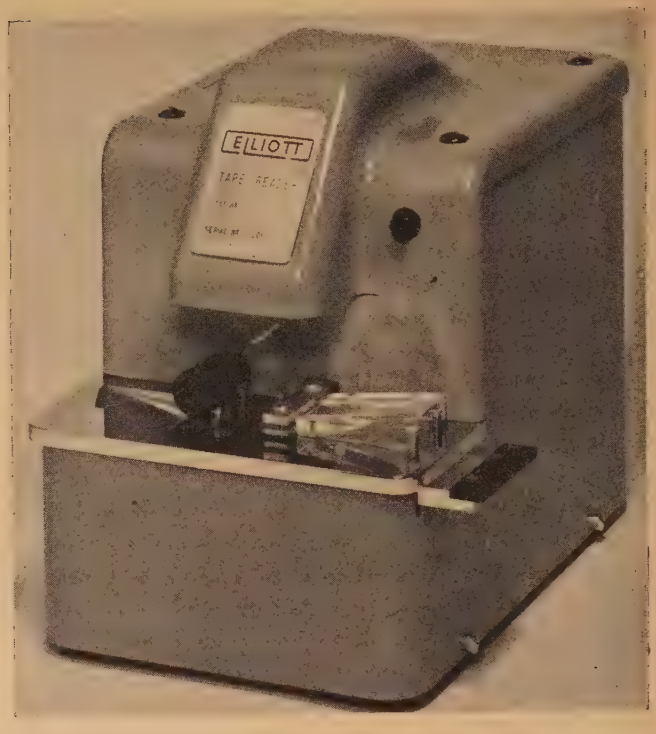
A series of new senior appointments have been announced by *The National Cash Register Company Ltd.*, in the field of electronic data processing.

Chief of these is the appointment of Mr. W. B. WOODS, a Director of the Company, as "Director of Sales" in which capacity he will be responsible directly to the Chairman for sales policy concerning all the selling activities of the Company.

Mr. Woods, who is a well-known figure in the Office Equipment Industry, was President of the Office Appliance Trades Association during 1951.

To execute policy at Divisional level, Mr. Woods will be assisted by Mr. W. R. HART and Mr. S. J. CONWAY who, as Managers of the Adding and Accounting Machine Division and the Cash Register Division respectively, will direct the operations of NCR's United Kingdom selling forces which, together, number some 500 men.

* * *




## Elliott High Speed Tape Reader

A new high speed tape reader has been produced by *Elliott Brothers (London) Limited*, a member of the *Elliott-Automation Group.*

It is designed to read standard 5, 7 and 8 hole punched paper tape at any speed up to 1,000 characters per second and to stop within a character. The characters are sensed by phototransistors, which are illuminated through perspex light guides. The transistors and guides can be withdrawn from the instrument in one unit, should a transistor require replacement.

The tape is drawn through by a pair of rollers, the upper roller being fixed on the end of a motor shaft. The position of the lower roller is controlled by an electromagnet, the amount of movement being sufficient to remove the drive from the tape when desired. The tape also passes between two flat surfaces, the pressure between these being controlled by a second electromagnet. This provides a braking action on the tape, which always overrides the action of the driving rollers.

The instrument is complete with lamp, driving motor, electromagnet assemblies and transistor assembly, but does not include any electronic control circuits. The supplies required are 240 V 50 c/s mains, 12 V 3 amp A.C. or D.C. for the lamp, and a low voltage supply not greater than about 20 volts for the phototransistors. The electromagnet coils each have a total resistance of 65 ohms, and will operate correctly on 100 m.A. D.C. The overall dimensions are $10\frac{3}{4}$ in. × $6\frac{5}{16}$ in. × $8\frac{1}{4}$ in. high.

*Editorial*

# SPIRITUAL REVOLUTION

"Quite suddenly, after a period of hesitation and doubt, the upper crust of British industry has, in the past two years, decided in favour of the revolution inherent in the electronic computer.

"It is in fact a deep spiritual revolution, which upsets many habits of mind. You start with the idea of getting a closer control on industrial and commercial operations, by feeding data to the machine and letting it sort out a mass of complicated fact, and you end by adopting a new approach to the whole business of making decisions.

"However, the willingness to accept the revolution is still confined to a small minority of firms.

"A surprisingly large number of people are now manufacturing this equipment, considering the size of the prospective market. That is welcome evidence of the scientific vigour of British industry. But it also probably means that there will not be enough sold in the end to justify the whole of the investment in research by all the firms concerned."

So wrote the economic editor of *The Observer*, Mr. Andrew Shonfield, at the time of the Computer Exhibition. This sober statement is important in the enthusiastic flush of success of a new industry. Computers have been exported to the Commonwealth, to Europe, and now, as reported elsewhere in this issue, to America. But what is the size of the market? After satisfying the needs of those who need vast calculating power and those with large-scale data processing problems, how many other potential users are there who have the resources to invest in a computer, to make full use of its capacity? More than one feasibility study has shown that sensible reorganisation of a system on orthodox lines would give the most efficient result.

Manufacturers cannot continue to pour funds into research and development indefinitely. Is the recent merger of two punched card and computer companies a forerunner to others? In the field of data processing, manufacturers clearly have a commendable faith that Mr. Shonfield's spiritual revolution will overtake the large majority of potential business users; only in this way can the computer become an essential part of modern business practice instead of just a rather large office machine with limited application.

# COMPUTER COMMENT

## *Electronic Fred*

Efforts have been made in recent years, both in this country and the United States, to produce devices that, by scanning letters or figures electronically, are able to "read" printed material or coded information.

Most of the equipment produced, however, has suffered from the disadvantage that it has been highly complex technically and consequently expensive. Engineers of *E.M.I. Electronics Ltd.* have developed FRED, a Figure Reading Electronic Device, which in comparison with other figure readers is very simple.

FRED can read either optically, like its human counterpart, or magnetically with the aid of specially prepared inks, at very high speeds. Both methods have widespread uses, but where documents to be read have to be passed through several hands and are likely to accumulate overprints or defacements, the magnetic system has definite advantages.

A special typeface that varies little in appearance from standard numerals, and is therefore easy to read, has been designed to allow maximum tolerances.

There are several possible applications of FRED. In its magnetic form it is ideally suited for reading cheques and invoices for the purpose of sorting or feeding information into accounting machines. Cash register entries can also be scanned and the information fed into a central accounting system.

As a computer input system the equipment offers great advantages. Much of the information which is now fed into computers by means of punched cards or perforated tape can be prepared "in clear" and read automatically into the computer.

FRED can also be used for reading route information or serial numbers of objects on conveyers or railway trucks. The logic of the circuits in FRED enable fifteen characters to be read, of which the arabic numerals 0 to 9 will normally be included with alternative options for using the other five. The figures 10 and 11 in the pence column of an accounts entry can be read as single digits, and a wide range of conventional symbols can also be provided.

The characters are read by moving them smoothly past the reading head and there is no need to bring them to rest or centralise them. The maximum speed of operation of the equipment is determined in general by mechanical limitations rather than those concerned with electronics; it is claimed that the logic of FRED can read 100,000 characters a second, though at present the paper speed is such that the laboratory model operates at 130 characters a second.

* * *

## *Second Computer at N.C.R. Headquarters*

Another NATIONAL-ELLIOTT 405 Electronic Computer is being installed at the Head Office of the *National Cash Register Company* in Marylebone Road, London. This second 405 computer is to meet the demand for computer and data processing services, and when in commission will be the largest and most comprehensive 405 installation in the world.

This seems to make one area of London the most "computer concentrated" district in Europe.

* * *

## *Radar Simulator Systems*

The SOLARTRON Radar Simulator Systems, of which the first (valued at £125,000) is to be despatched to the Italian Army authorities, enable fully realistic training and exercises to be performed without having to use operations staff,

airfields, aircraft and radar stations and without interference with civil air routes.

In the Italian scheme the SOLARTRON system uses analogue computers to simulate targets, radar stations, attacking and defensive aircraft and electronic counter-measures. Surface vessels or submarines (wholly or partly submerged and using Asdic), shipborne radar, tidal motions, height-finding radars and air traffic control systems could also be simulated if required in other SOLARTRON Radar Simulator Systems.

The capital outlay of the equipment can be saved during the first few live exercises simulated. But, also, danger to civil aircraft, risk of collisions between exercising aircraft and the possible loss of life are eliminated. The cost of the loss of only one modern fighter aircraft is many times more than an extremely large SOLARTRON Radar Simulator System.

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## *Moscow Conference*

The first International Congress for Automatic Control is to be held in Moscow from 25 June to 5 July 1960. It is intended that the Congress should include

(*a*) the presentation and discussion of scientific papers,

(*b*) excursions to scientific institutions and to various automatic processes, and

(*c*) visits to centres of culture in Moscow.

* * *

## *Monitoring of Harwell Data*

A transistorised data recording and analysing system has been developed by *E.M.I. Electronics* and *U.K. Atomic Energy Authority* to assist in handling the enormous quantities of statistical data required from nuclear experiments at Harwell.

The recording units take the measured quantities, for example, the neutron time of flight, and convert them into binary coded digital form and record them on magnetic tape. At the end of the recording run, the tapes are removed for processing on the central analyser. The analyser handles the tapes at up to 100 inches per second and sorts the information into ordered array in a ferrite core store. The stored information can then be used for further data processing.

* * *

## *Transistor Exhibition*

An International Transistor Exhibition will be held at Earls Court from 21–27 May, promoted by The Institution of Electrical Engineers. It is claimed that there are 800 different types of transistors and that they are already an integral part of satellite instruments, record players, hotel and hospital systems, nuclear radiation detectors and electronic computers.

* * *

## *Binding in the Tab. Room*

A new method of binding using Planax Equipment should prove of value to tabulating and computer departments. The equipment sold by *OMASCO Ltd.* provides a convenient method of binding continuous stationery without separating the sheets. It should help to solve the problem of storing away tabulations for future reference and it allows the bound leaves to open completely flat without obscuring marginal notes.

* * *

## *Electronics Research*

Beginning with the current volume, the French quarterly publication *Acta Electronica* will include abstracts of each article in English and German.

Each issue is devoted to a particular topic in electronics. Previous issues have dealt with such subjects as photomultipliers, light sensitive semi-conductors, and magnetic recording. Copies may be obtained from Laboratoires d'Electronique et de Physique Appliquée, 23 rue du Retrait, Paris (20e).

* * *

## *The Computer Society of South Africa*

We have been pleased to receive the first issue of *The South Africa Computer Bulletin*, a quarterly published by *The Computer Society of South Africa Ltd.* Its main article is on the *Burroughs* (DATATRON 205) electronic data processing system ordered by the *South African National Life Assurance Company*. Insurance companies seem to be giving the lead for computer use in South Africa.

# DEUCE USERS' ASSOCIATION COLLOQUIA

A series of one-day colloquia of interest to users of DEUCE has been planned by the DEUCE Users' Association. The first two of these, dealing with automatic programming and the solution of ordinary differential equations, were held in London during November.

Both of these colloquia were attended by large audiences with representatives from nearly all of the establishments using DEUCE. A particularly gratifying feature of each occasion was the amount of very valuable discussion which followed the various papers, totalling nineteen in all.

At the first colloquium, devoted to automatic programming, several new schemes were described. These included the automatic coding scheme (*see previous issue, p. 80*), an alphacode/DEUCE translation program, a translation program known as Easicode, and a new matrix interpretive scheme. The latter, to be known as Scheme C, is complementary to the existing schemes A, B and Z. Another extremely interesting contribution concerned experience gained with TIP 2: the new, faster and more comprehensive version of the invaluable Tabular Interpretive Program.

The second colloquium provided a variety of papers devoted to the numerical solution of ordinary differential equations. These included both general papers dealing with, for example, the stability of numerical solutions, and papers on particular numerical methods. Included in the latter were papers on such methods as the Runge-Kutta, Predictor-Corrector, Fox-Goodwin and de Vogelaere methods.

# PROGRAMMING SERVICES AND ADVICE FOR PROSPECTIVE COMPUTER USERS AND OTHERS

*by F. Clive de Paula, T.D.*

*This paper was presented to the Leeds Branch of the Society on 13 January 1959. The author reviews some of the situations in which different people have found it convenient to make use of outside programming services; he also reviews the different sources to which they can turn for such services and advice. He then discusses some of the problems facing those who provide such services, and some of the difficulties that arise in using programming services and computers on a service basis.*

If one wants to use a computer, one is faced with the inevitable need to get the necessary program written. This presents no particular problem to the large business giants, as they can afford to engage and train the necessary skilled staff and thus build up their own teams of programmers. However, there are many other people who might like to be able to use computers but who, for various reasons, may not immediately want to wrestle with the problems of programming.

## *Who are the prospective users?*

One must, therefore, see first of all who are these prospective users of computers in order to assess just what sort of help they are likely to need. As has been said, they may be the smaller businesses who don't feel justified in setting up a programming staff of their own; or they may be the larger firms who think that in due course they may make considerable use of computers, but who want to feel their way gradually into the use of computers without initially committing themselves too deeply.

There are also a number of much smaller organisations, who may be glad of some help with programming. There are, for example, design offices and research laboratories with computing problems; civil engineering firms with numerous calculations to make in connection with a contract, or in connection with a number of tenders; technical engineers with involved calculations of a repetitive nature; consulting engineers and similar professional advisers; and there may be associations, covering an industry or a group of similar firms, who may contemplate using computers to help solve common problems.

*

In the first instance, these people may not want to provide their own programming staff, and may prefer to get outside assistance, because they realise that, without a fairly detailed knowledge of computers and experience of their use, it is extremely hard to form a reliable view on

(*a*) whether their particular problem is in fact one which is suitable for solution by a computer,

(*b*) how much use they are likely to make of computers in the long run,

(*c*) what exactly are the economics of the whole operation, and

(*d*) which particular computer they ought to use.

Thus, for example, outside programming services have been found useful to the engineering design office of a medium-sized business. They had a clear idea of the problem they wanted to put on to a computer, but they wanted to try out the idea first to see how it worked before committing themselves too far. Having found, at not too great cost, that it worked all right, they then carried on getting their own computer and building up their own programming staff.

Or there is the very large firm, who own their own computer with their own programming staff, who are working on technical design work. Having decided that they would like to try doing clerical and accounting work on the computer, they felt that they would prefer not to divert the energies of their own programming staff from their technical work, and therefore decided it would be more convenient to get outside programming services to do the research and development work on the accounting problem.

Then there are small research teams, working on important projects, who think that computers might help, but they don't want to divert their limited resources to studying how to use computers. They have therefore turned to outside programming assistance; and having got satisfactory results, have decided to continue that way, without bothering to set up their own programming section.

As compared with this, there is the very large firm who have ordered a large computer of their own and have set up a programming team of their own, that has been doing

the necessary methods study and programming for some time. In the light of this experience, they soon realised that program writing is very much more time-consuming than they had first anticipated. To engage a large enough staff to dispose expeditiously of this initially large hump of work would have left them with a much larger staff than they would need in the long run. It was not their policy to engage staff and then dispose of them when no longer needed. They therefore decided that, although they knew how to do the work themselves, they would prefer to call in outside programming assistance to help get rid of part of the large initial load of programming, which was needed to get their computer fully loaded and operating economically.

There are other rather unexpected users of programming services who are faced with isolated computing problems that are not particularly complex but that take an inordinately long time to do by hand—such as a firm of stockbrokers who wanted to do statistical analyses of the stock markets. Done by hand, these calculations would never be finished in time to be of any use in operating on the market. Done on a computer each week on a service basis, the answers are obtained in a few hours. And the firm of civil engineers whose draughtsmen have long series of calculations to perform in the course of a contract. They can get the calculations done by hand methods, but it occupies skilled men for many weeks. By doing the work on a computer, they release draughtsmen for more creative work—draughtsmen who are in short supply throughout the country.

But the more common user of independent programming services is the medium-sized firm whose management thinks that perhaps a computer might help them. Firstly, they want advice on whether or not to use a computer at all, and if so what particular work should be put on it. Then they want advice as to which computer they should use, and whether they should contemplate buying a machine, or should just hire time on a computer when they need it. Finally, they want help with getting the necessary programs written.

It will be appreciated that the needs of all these different types of user are not identical, except in so far as they all realise that they would be glad of some reliable advice and help.

## *Where can they get help?*

In such circumstances, they must look to see where they can get help. Let us, then, review the different sources of such assistance, and at the same time discuss some of the problems facing those who seek to provide the necessary services. But, in general, it can be said that any help they get must come either from the computer manufacturers; or from the universities which have got computers; or from the large firms who have bought computers; or from firms that provide completely independent programming services, such as now exist.

* * *

## *The computer manufacturers*

The different computer manufacturers are generally quite willing to help the prospective computer user with his programming problems. But it must be borne in mind that they are in business to sell computers, and therefore the prospective user of computers in a small way is not of such immediate interest to them. As a result, amongst the computer manufacturers, enthusiasm varies for casual programming jobs. Some are more ready and willing to help than others. At the extremes, one appears to be seeking such work, whilst another turns it away politely if it looks small. This latter manufacturer privately admits that this is because the small spasmodic user of computers is unlikely ever to buy a computer, and the manufacturer wants to use his own programmers as an adjunct to his sales force, helping the customers who are buying machines—an attitude which is perfectly understandable.

In any case, there is, for the user, always the problem of deciding which manufacturer he is to approach for assistance. Without knowledge as to which computer is best suited to the particular problem, the prospective user is faced with a problem of selection, which may get solved either by the persuasiveness of a particular computer salesman, or negatively by the unwillingness of others to help, but not necessarily by correct reasoning. Alternatively, the user may approach all the manufacturers and then try to assess their relative merits. But again the selection may still not be easily made, and, in any case, this tends to waste both his own time and that of all the manufacturers; and the inexperienced may still be left with a feeling, once the choice is made, that he may be missing something better elsewhere.

## *The universities and colleges*

An inquirer can, then, turn to the universities and colleges of advanced technology, where computers have been installed. Again, some element of choice faces the inexperienced inquirer, although in the majority of cases this may be solved by the simple expedient of approaching the nearest one. Most of them have similar computers anyway, and local universities are more likely to be sympathetic to local inquiry. Nevertheless, the fact remains that all the university machines are not identical and some are better suited to certain jobs than others, or are better equipped for certain work.

The university staff will almost certainly be willing to help with programming problems. They may, in fact, be very glad of some "live" problems to work on. However, it must be recognised that there are limits to what they can do. If they get involved in too extensive a program of work for outside bodies, it may begin to interfere with their own university work—and if things go too far the rest of the community may begin to ask why they should "subsidise" work for one particular firm. For it can happen that some element of subsidy underlies the work done by a university, even if the recipient does pay something for the services he receives.

## Private computer owners

Some of the private owners of computers might be prepared to help the smaller firm interested in using computers. But it is clearly not reasonable to expect them to do a great deal. They have their own problems to grapple with. Many of them are very happy to give general advice and to pass on to others the benefit of their experience, but they cannot be expected to do very much to help smaller firms with the actual programming work.

## Independent programming services

There remain, then, independent programming services, not tied to any particular machine, organisation or computer manufacturer. Here the prospective computer user is entitled to expect to get reliable, independent, professional help and advice.

If he is to feel reasonably sure of getting the sort of help and advice he wants, he must be satisfied that, for a start, he is getting advice which is based on the necessary sound, broad knowledge that is required to make it reliable.

On the whole it would also seem better for the prospective user to get help that is independent of any computer manufacturer so that, if there is any bias, it is entirely on the side, for example, of selecting the best computer for the job—and does not set out to prove that a particular computer can do the job in question. To the person seeking assistance, there can be a real value in independence.

It also seems best for the prospective user to get advice on a professional basis so that the reputation (and livelihood) of the adviser depends on his giving good advice—so that the adviser has got to build his reputation and practice by good work rather than by good advertising.

* * *

## Problems of providing such services

Having looked at the problem from the point of view of the user, let us turn to the problems of providing the sort of services that are required.

## Need to have a team

The first thing that becomes clear is that, in general, the needs of such a wide variety of users can only be met by a team, since one individual could not possibly have all the knowledge required. A team of people is needed, each with experience and training on different computers and on different problems.

In practice, it also became clear that each member of the team ought to be trained to program at least two different computers. There are two reasons for this. From the practica[1] point of view, it enables a smaller team to cover a greater variety of computers. But more important still, it gives each programmer a far greater flexibility of approach to computer problems.

Ideally, the team should cover every computer made, but clearly this is impracticable, since, in any case, there are some that are either very large or very unusual indeed and are unlikely to be used.

## Wide selection of computers available

Experience also shows that there is at present a wide selection of computers available for the use of the person who wants to do a bit of computing. This width of choice applies not only to different makes of computers, but also to their ownership and geographical location. To start with there are, of course, the demonstration and service machines of the computer manufacturers. These machines are mainly kept for demonstration purposes and for initial help on program testing for purchasers. However, some manufacturers welcome spasmodic odd jobs, even if some of the others are less enthusiastic. Then there are the machines at the universities and colleges of advanced technology, in different parts of the country. Finally, there are a number of publicly and privately owned computers all over the country, some of which are for the time being very much under-utilised.

Therefore, in selecting a computer for a particular client's job, quite a number of different factors must be taken into account before selecting one machine, and information must be collected and held available on these points:

(*a*) Which particular makes of computer can handle the problem most easily, and what ancillary equipment is likely to be needed to do the job efficiently;
(*b*) What computers of those makes are available within reasonable geographical proximity to the client in question;
(*c*) In the event of not being able to get on to the selected computer when needed, are exactly similar machines available elsewhere in the country; or is it the only one of its kind available?;
(*d*) What is the price per hour charged by each computer owner.

In this latter connection, the present situation is one in which the demand for hired time on computers is only just beginning, so that strength on the buying side is small. (On the selling side of computer time, we need to be careful that the influence of such bodies as the University Grants Committee and the different computer users associations does not artificially maintain computer time hire rates at a level that bears no proper relation to the cost of providing that computer time.)

Nevertheless, when selecting a machine, certain ones that are available stand out as being particularly convenient for certain types of work, as for example the machine at Leeds University which is being specially equipped to handle commercial and industrial type problems. Whereas technical and research problems can be handled particularly easily on the Manchester University machine, especially if use is made of the autocode procedures developed by Mr. Brooker there, which have been a great help in organising a programming and computing service more or less on a postal basis.

### *Geography not such a great difficulty*

In this connection, it has become apparent that the relative geographical locations of the user, the programming service, and the computer to be used, do not create as much of a problem as might be anticipated. Nor is it necessary to make use of teleprinters and other advanced forms of communications equipment.

A detailed study of the costs of the transmission of data in bulk shows, of course, that in certain circumstances teleprinters, *Telex*, and tied telephone lines have their uses—and their risks of transmission error. But in general, for speed, frequency of service, and reliability, there is not much better way than the railway letter service by passenger train. There is no limit on volume transmitted, as there is on a telegraph line which can only transmit at a certain speed for a limit of 24 hours in a day. The data cannot get distorted en route. It can, of course, get lost, or mislaid, completely. For this reason, railway letter service is not perhaps advisable if the proposed journey involves a change of trains. It is probably also preferable for the destination station to be the terminal point at which the particular train stops. If these conditions do not apply, then use can very simply be made of the G.P.O., who themselves rely on the railways and have a well-organised system for getting data to its destination. The use of their services does, however, impose some delay that can be obviated by incurring the trouble involved in using the railway letter service.

Thus, in practice, it has proved quite feasible for a firm in the City to have work done regularly each week on a computer in the provinces. The data is prepared on sheets, and put on to an express train, which is met at the other end by a clerk from the computer office. The data is then punched on to paper tape, run on the computer, and the computed results are sent back in the post the same evening, to arrive first thing next morning.

In another case, a monthly accounting job is sent down to London from the provinces. In this case, the time schedule is not quite so tight, and so the whole thing is done through the post. At Christmas time when posts are subject to delays, it might be desirable to transfer to railway letter service.

### *Defining the problem to be solved*

When programming technical problems, it was not anticipated that any particular difficulty would arise over the formulation of the problems themselves, since these are normally expressed as mathematical equations. However, it has been found in practice that a good deal of abortive computer running has, on investigation, been found to be caused by the incorrect formulation of the problem in the first place.

Trouble has also been caused over the provision of test data on which to test the program and over the pre-calculations of the results expected from the test data.

It is not intended to imply that these troubles are peculiar to the use of outside programming services, or to the use of computers on a service basis. They occur whenever computers are used, and slips of these kinds can be expected and must be guarded against. But here geography does accentuate the difficulty, if the person who formulated the problem, and the programmer, and the computer operator are all fairly widely separated from each other. The telephone helps in overcoming the trouble when it arises, but it must be emphasised that it is worth taking a great deal of time and trouble in the first place to try to prevent these difficulties arising.

In the commercial and industrial accounting field, it might again be thought that certain operations are reasonably simple, straightforward and clearly defined. Yet it is extremely easy to overlook some odd exception that sometimes occurs, or some small part of the routine that in practice is not, in fact, operated in the way that it is thought had been laid down.

### *Avoiding being over-ambitious*

When a problem is being planned for solution on a computer, it is as well not to be over-ambitious in the early days. There is always the temptation of trying to get the computer to do too much, to cope with every queer eventuality. On the basis of "walking before running," it may well be better to aim at fairly simple programs in the first place, and leave the odd exceptions to be handled outside the computer program. Elaboration can be added with experience.

### *Program testing on "live" data*

The user must also realise that his program cannot be looked upon as proved and tested until it has been run with "live" data. In the case of programs to handle regular routines on a repetitive basis, it will nearly always be found that some final details of the program need revising, when tests are carried out with "live" data. This applies to all computer applications, of course, and is only mentioned here so that the user does not think that these final amendments, when running the program on "live" data, are caused by bad programming. They may be; but more often than not they are caused by the fact that this final test brings to light aspects in which the problem was not, in fact, correctly defined in the first place.

### *Need for computer trained O. and M. men in programming team*

This trouble is a difficult one to overcome, when trying to put accounting and clerical routines on to computers. It is often caused by the fact that the present accounting and clerical routines were designed for manual operation—or perhaps for processing by conventional accounting machines. As a result, the procedures are not necessarily in a suitable form for transfer to the computer.

This makes it essential for the programming service to have experienced methods study men, with an understanding of what a computer can, and cannot, do, and of

the most suitable ways of designing procedures so that they can be put more easily on to the computer. In the early stages of defining the problem, the methods study man can, when necessary, work in close co-operation with the programmer, in an attempt to avoid perpetuating on the computer inefficiencies in the present system which may no longer be necessary when using a computer.

The methods man and the programmer must each have a good understanding of each other's problems. They must work closely together as a team, to which each contributes his particular skill and experience. If the study of procedures and the programming are done "at arm's-length," successful computer routines are very hard to achieve.

### *Using computers on a service basis*

Having written, tested, and finalised the program there is then simply the question of making use of it. In the case of technical programs which may only be used perhaps once, or at irregular intervals, this presents no particular difficulty; and it can be organised by the programming service if the user does not want to do it himself.

However, in the case of regular clerical routines, a small problem does arise in connection with the current data to be processed each time. This current data has got to be put into a form in which the computer can accept it for processing. This is normally in the form either of punched cards or of punched paper tape.

If punched cards are being used, there are no very great difficulties. The user himself may already have the current data on punched cards which have been used for some other purpose; or he may have the equipment and staff who can get the cards punched. If he has not, there are card-punching services available, where this work can be handled. Or the punching of cards may be done, for a fee, by the computer owner.

However, if punched paper tape is being used, there may not be quite so many facilities available, since punched paper tape is not as widely used in this country, with the result that there is not so much tape-punching and editing equipment available. The owner of the computer which is being used should be able to arrange for the necessary tapes to be punched. But if this is not convenient, it has, in certain instances, been found possible to organise the tape-punching somewhere else. However, the fact remains that this fairly simple operation remains, at present, something of a problem.

It is also more difficult than it should be to get tapes punched accurately. If there are any inaccuracies left in the tapes, it is, in the first place, going to cause a waste of expensive computer time, which can be a costly affair. It can also cause delays, when using computers on a service basis, if the corrections have then to be carried out at some place which is at a distance from the computer.

This means that the very greatest care must be taken to ensure accuracy in cards and tapes of current data, and it may well be worth carrying out what may at first sight appear to be an excessive amount of checking. It may even be worth preparing a special computer program which can first of all be run with the current data cards or tape, with the object of checking the accuracy of the current input data. This program might check such things as the compatibility and credibility of the data; check that no items appear to have been omitted; test all the check sums and control totals, etc. These are checks which are often made by clerks in manual systems, and which a computer can carry out quite quickly. No printing should be involved, since the computer would not print out anything except any errors disclosed. Such testing might obviate an expensive waste of computer time trying to do a run with inaccurate data.

Despite these, and other, difficulties in using computers on a service basis, there can be quite considerable advantages in entering the computer field this way. It is like entering a swimming-bath at the shallow end, rather than jumping in at the deep end. One can get used gradually to the problems of computers and to what happens when one uses them. As a result, one is in a better position to assess just how useful they are in solving the particular problems in question. One can also acquire a practical knowledge of the economics of the whole operation. It may not be as spectacular as purchasing a computer of one's own, but it may help to avoid quite a few headaches in the long run. It also reduces considerably the amount of money one may initially need to lay out when exploring the use of such a new instrument.

## UNIVERSITY NEWS

### *Ferranti gets Lucifer "Taped"*

On Saturday 17 January a large crane could be seen outside Eldon Hall, where the Leeds University Computation Laboratory is housed, unloading four packages from a lorry. Two of these are now assembled in the machine room to form the control unit for the other two—magnetic tape decks supplied by the *Electrodata Division* of *Burroughs* to *Ferranti* for use with their computers. It is expected that, by the time this news reaches members, the system will be commissioned and in operation. It is planned to use this equipment not only for the solution of scientific problems, but also for research into techniques of data processing, and to carry out clerical work for the University administration and local firms.

### *Long-term Grants for Universities*

The Department of Scientific and Industrial Research state that grants for University investigators undertaking special researches, which have normally been limited to a maximum of five years, may now be awarded for up to seven years with the possibility of continuing support for a further ten years.

# LONDON MEETINGS

## THE MECHANIZATION OF THOUGHT PROCESSES

Dr. A. M. Uttley (Superintendent of the Control Mechanisms and Electronics Division at the National Physical Laboratory, Teddington) gave to the Society, at Northampton College of Advanced Technology (London) on Tuesday afternoon, 9 December, a review of the Symposium on The Mechanization of Thought Processes which was held at N.P.L. from 24 to 27 November 1958. The proceedings at Teddington will be published by Her Majesty's Stationery Office in due course.

During the Symposium 31 papers were presented and there was some 30 hours of discussion. In the time at his disposal Dr. Uttley presented a few impressions and indicated some questions of general interest which appeared in a number of the papers. He was able to give members of the Society a picture of how all the papers fitted together around a few common themes. The form of the Symposium had been suggested by Lord Halsbury to show Britain's scientific side to overseas visitors at the time of the Computer Exhibition and Business Symposium.

The subjects of the papers included, on the first day, five on general principles. On the second day, the subjects included automatic programming and mechanical language translation. There followed sessions on speech recognition, learning in machines, and implications for biology and industry. Dr. Uttley said that there had been fairly active discussion at each session, which would be reported fully in the published proceedings. It had been of interest to note that during the sessions on biological applications some of the physiologists had talked in fairly good engineering terms; it appeared that an explanation of what went on in the nerve tissues was often more easily explained in engineering language.

By means of examples on the blackboard, the speaker stressed a number of principles which could be noted in many of the discussions. There was the need for a form of *aide-mémoire* to get information into an ordered sequence. Both in medical diagnosis and in the legal world, the presence or absence of symptoms had to be recorded for all observed cases, together with the presence or absence of diseases, etc. If it were possible to search through enough cases, the field of probable diseases was narrowed when confronted with the symptoms of a particular case. This work had been facilitated on punched cards in Paris, and a London firm had exhibited an analogue device at Teddington to facilitate medical diagnosis. [This device is available from *Lewis & Co. Ltd.*, of Gower Street, W.C.1.]

Throughout the conference there had been discussion on the problem of selecting information from a large store. The human brain could often come up quite quickly with the correct answer to an unexpected question (e.g. paternal grandfather's Christian name?), which would require extensive and time-consuming searches in any mechanical system. The techniques of classification of data were fundamental to the whole problem of mechanization of thought processes. One could select the desired information by surveying available data in successive steps, looking at the classifications one attribute at a time, and gradually narrowing the field of search. In this work the word *descriptor* had been used to indicate some key idea which guided the search at each stage: successive *descriptors* were applied until the sought-for item was found.

A second principle had been brought out in the papers on medical diagnosis and machine learning: this was the process of defining the characteristics of a situation or subject by a series of statistical probabilities that given characteristics would be observed. This technique also came into pattern recognition and mechanical translation. When even the human reader occasionally failed to understand the handwriting or speech of another person, it was probably optimistic for the engineer to hope that one day he could translate all data accurately.

In mechanical procedures it was always necessary to process a large amount of data to establish correlations between attributes, etc., and this led to consideration of a third feature, the considerable *redundancy* in all the usual methods of communication. In such questions as character recognition one might analyse a pattern on a mosaic of $10 \times 15$ ($= 150$) elements, each of which could give a signal which was either "black" or "white." With 150 elements there were $2^{150}$ possible combinations of signals or "shapes" to be distinguished, but in scanning the alphabet we were interested only in 26 letters: these could be identified, if the letters were well located, by signals from 5 elements only in the mosaic. The paper and optional coding device demonstrated by Dr. H. B. Barlow (Cambridge) had outlined a system of "automatic plastic coding" to reduce redundancy; the work of Drs. Taylor and Selfridge was also aimed at reducing the redundancy known to be present in data. When signalling the outline of shapes in pattern recognition, redundancy could be reduced by signalling only the boundaries of the image and points where there were changes of direction.

In speech recognition the work of Professor D. B. Fry and Mr. P. Denes discussed the analysis of speech into

about 14 "phonemes" and by collecting signals from this analysis it was possible to identify 50–60% of the speech. The proportion could be improved by introducing conditional probability of word sequences and word neighbours.

For those who wanted a summarised impression of the Symposium he recommended the opening paper on *Some Methods of Artificial Intelligence and Heuristic Programming* by Dr. M. L. Minsky (Massachusetts Institute of Technology). It provided an excellent foundation for the work of the conference.

A simplification of some of the problems was provided by Dr. J. McCarthy's paper on *Programs with Common Sense*. Simple problems, such as the best route to follow if one wanted suddenly to go to a distant town, were usually solved by the human mind in a few minutes, based on experience of similar situations. A computer confronted with the same problem would consider many impossible situations and alternative procedures before finally arriving at an optimum solution.

Dr. A. P. Ershov's paper on *The Work of The Computer Centre of the U.S.S.R. Academy of Sciences* reported several teams working in different places on language translation and automatic coding in Russia.

Dr. Uttley concluded his review by suggesting that problems of language translation should be approached by a combination of the *Thesaurus* method of listing all possible alternative meanings and a process of logical deductions based on the rules of grammar.

Readers of *The Computer Bulletin* will await with interest the publication of proceedings of this four-day Symposium, admission to which, of necessity, was by invitation only. The Society's meeting concluded with a brisk discussion and a vote of thanks to the speakers proposed by the Chairman of the meeting, Dr. A. D. Booth.

## *"SHARE" Development*

Four meetings have been held in the London area during the first two months of this year. The first was given by Dr. K. V. Hanford (*I.B.M.*) on "The SHARE Compiler, Assembler-translator for the IBM 709." This was by way of a report on the latest developments in this international project to simplify the statements used in specifying programs for the large IBM computers. For example, although all programs must finally be completely specified with regard to the storage location to be used for instructions, constants, etc., these and similar details need not concern the programmer in the statement of the problem. This and other detailed organisation of the target program is itself dealt with by a series of special routines.

The strong American influence in this project was revealed by the use of such terms as S.O.S. (SHARE Operating System), S.C.A.T. (SHARE Compiler Assembler Translator) and S.A.P. (SHARE Assembly Program). Another term which was often used referred to the SQUOZE deck of cards. The impact of technology on the living language is such as to make one wonder whether this term is here to stay.

## *Business Group*

There were two meetings on topics of special interest to the business users during January. The first on "A Study of the Application of a Computer to Production Control" was given by Mr. W. T. Kease, and was based on a paper prepared jointly by Mr. D. C. Hemy and Mr. W. T. Kease, both of *E.M.I.* There was an excellent attendance and those present must have been impressed by the detailed investigation which had preceded the drafting of the proposed programming procedures.

The other lecture was the first of a new series of meetings which had been organised by special request of Business Group members, to deal specifically with topics of interest to them. At this meeting Mr. T. E. Doy (*Ford Motor Company Ltd.*) spoke on "Planning and Operating a *Powers-Samas* PCC on Stores Accounting." It is hoped that full accounts of these and the other papers will be given in *The Computer Journal* in due course.

## *A New Machine*

In February we had a talk by Mr. E. J. R. Hewitt (*International Computers and Tabulators Ltd.*) on "The Logical Design of the Type 1400." As in the past, a meeting on a new machine attracted a very large attendance. Mr. Hewitt dealt with the broad philosophy of the machine and related this to the proposed order code. This particular machine has an operating speed which must have impressed many of the scientific users present. It will have a large immediate access store of 1,000 words which can be backed up by more than 50,000 words on 5 drums. In addition, fast card readers, printers and magnetic tape units can be linked to the machine. There is a novel control system used on these latter units which enables them to be used off-line as well as on-line, and which establishes priority between them when on-line.

# REGIONAL BRANCH NEWS

## BIRMINGHAM

The Birmingham Branch held three meetings during November and December, dealing with mathematical methods, machine design and production control.

On 7 November Mr. F. I. Musk, in a talk on "Monte Carlo Methods," described the use of a computer to generate a synthetic set of orders for a machine loading study. The orders varied in type, number of packages and total machine time required, and the speaker explained how the computer was programmed to generate random values for these factors, subject to the frequency distributions found to exist in the orders actually handled by the factory. The final computer task was then to operate upon the random set of orders according to a set of machine loading rules, and evaluate the overall efficiency of the machine shop. In this way the most effective set of loading instructions could be devised without upsetting normal production.

A meeting on 1 December was devoted to an account of the new ACE computer recently put into service by the National Physical Laboratory. Mr. G. G. Alway described the main engineering features and calculating facilities of the machine, and explained how it had been developed from the earlier pilot model. He pointed out that there were in all four highways, which could be used simultaneously to give a optimum machine speed. In addition, the multiplier was faster than that used in the DEUCE computer, and the use of fixed rather than relative timing in the instructions was expected to simplify the programming. To help program testing, an elaborate series of "request stops" could be incorporated, and instructions could be obeyed at various rates or one at a time. Mr. Alway concluded with a short review of the various problems being tackled by the N.P.L. computer section.

At the last meeting of the year, on 10 December, Mr. R. B. Baggett (*Job White & Sons Ltd.*, knitwear manufacturers), gave a talk on "Production Control Experience through buying Computer Time." Mr. Baggett gave an account of the use of a computer to translate incoming orders in dozens of articles into orders for dyeing, spinning, and winding the correct lengths of various yarns to feed the knitting machines, and to issue the appropriate winding instructions to the machine operators.

The computer was also programmed to keep a check on the total stock, compare with an agreed minimum stock, and re-order when necessary. He hoped to use larger input cards in future work, and include the costing of each order. In conclusion, Mr. Baggett brightened a somewhat gloomy December evening with a very colourful display of typical knitted garments, whose production had been assisted by the use of a computer.

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## LEEDS

On 15 October Mr. J. R. Eades gave a talk on his visits to the U.S.A. in 1956 and 1957. Some of the earlier American applications proved to be uneconomic and, even in 1956, clerical savings of sufficient magnitude to pay for the equipment were exceptional. In the fields of better control, reduction of stock inventory level, and high speed data processing, however, economies were often being made successfully, but very little progress was evident in the field of *integrated* data processing, the tendency having been to approach computer problems rather in the manner of punched card applications.

In only two of some forty applications visited was operational research work done in conjunction with computers for data processing problems, while in every case the company concerned had underestimated the time required for processing a problem within the computer. The two main causes of this appear to be

(*a*) failure to anticipate down time due to operating troubles (e.g. in restarting a computer after a card jam or magnetic tape break), and

(*b*) insufficient care in preparing the initial specification and the insertion of more and more programmed checks as the development of a program progressed.

An Insurance Company, whose turnover in 1949 was 11 million dollars, expanded so rapidly that in 1955, when the turnover had reached 265 million dollars, an ELECTRO-DATA DATATRON was installed, with magnetic tape units, using MINNESOTA plastic tape. The tape, although not as densely packed as is IBM tape, proved highly satisfactory with no faults or dust problems. They were able to discontinue the hire of the two IBM punched card machines, the rental of which equalled the cost of running the ELECTRO-DATA computer. Before the hire of the IBM machines the company spent 8,100 clerical hours to prepare a quarterly classification report. When the punched card equipment was installed the time was reduced to about 150 hours plus additional time to compile the report manually. Now the computer does the entire job in under eight hours.

A very different situation prevailed at a public utility company where a large computer had been acquired for billing for some two million customers. Research by a study group had forecast a saving of 750,000 dollars per annum, together with a staff reduction of two hundred. Billing for 250,000 customers was begun in January 1956 with the idea of taking over all the two million customers stage by stage. But the programming time had been considerably underestimated and in addition it was soon realised that it would only be possible to cope with one million customers on a 16-hour shift, 5 days a week. A second large computer was therefore ordered from the same manufacturers, but of a different design. As programs were not interchangeable between the two computers a major re-programming task lay ahead.

The difference between the achievements of these two companies is probably due to their different methods of choosing a computer. Senior executives of the utility company had formed a committee to assess overall savings and choose the computer which they thought best suited to the job, whereas the Insurance Company had appointed a full-time Research Director to study several medium-sized computers in detail, in relation to the company's requirements. When the choice of computer had been made, he was appointed Machine Room Manager and controlled all the electronic and punched card equipment.

A firm of highway engineering consultants used an ELECTRO-DATA E101 to calculate arcs and radii of road surfaces at intersections in arterial roads. As the intersections sometimes involve seven levels, the calculations are often extremely complicated. The company sends out road survey teams, sometimes several thousand miles away from the Head Office in Chicago, and before the installation of the computer, the teams returned to Chicago and spent four of five weeks analysing their readings and checking them. If errors were detected the team would return to the site to repeat the readings. Now, each team remains on site, submits its readings to Head Office by telephone each night, and the computer records and checks them within a few hours. If any errors are detected, the survey team, being still on location, can repeat the readings immediately. It was estimated that the surveying costs were thus reduced to one-seventh of their previous level.

In his summary, Mr. Eades said he thought that the choice of a computer, particularly for data processing, should never be left to committees, but to a senior person or persons studying the question on a full-time basis. The technique of systems investigation requires a trained mind, an analytical approach, and, preferably, though not necessarily, some knowledge of mathematics. "The moral is," he said, "be sure you are right before you go ahead, but certainly go ahead, otherwise you will be left behind in this increasingly competitive world."

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## LEICESTER

Dr. A. S. Douglas (*Director of the Electronic Computing Laboratory, University of Leeds*) addressed the Branch at the Leicester College of Technology and Commerce on 3 December. His subject "Computers and Commerce" has appeared in the Society's publications but members enjoyed listening to Dr. Douglas in person and the opportunity to ask questions.

On 28 January at the College, Mr A. J. Barnard (*City Treasurer of Norwich*) gave an account of his experiences with a business computer, the ELLIOTT 405. His talk was greatly appreciated in so much as the difficulties of a pioneer were frankly discussed. Members of the audience, especially those connected with local government, asked many searching questions. In dealing in detail with all the points raised, Mr. Barnard discussed the importance of careful system study prior to going over to a computer system, the make-up of the actual team using the computer and the question of co-operation with auditors. He concluded by expressing his firm belief that computers will play an increasingly important part in the public, commercial and industrial activities of this country.

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## MANCHESTER

The first of the monthly lectures to be given in 1959 was held as usual in the Reynolds Hall, Manchester College of Science and Technology, on 6 January; Mr. D. G. Pedder (*Radio Rentals Ltd.*) spoke on "Customer Billing on a NATIONAL-ELLIOTT 405."

Mr Pedder started by giving his audience of some 20 members a brief description of the present organisational and accounting structure of *Radio Rentals Ltd.*, and an idea of the nature and size of the accounting problems involved; together with a summary of the computer system. The lecturer continued by describing the evolution of the company's Computer Centre, and the difficulties encountered, especially that concerning the very large number of different forms to be used in output. It was perhaps particularly interesting to note that he had found, as had many others, that the longer the machine was worked the fewer the machine failures.

The interest in this subject could perhaps be gauged by the very large number of searching questions that were asked. Mr. Gladman, proposing a vote of thanks to the lecturer, said that he, and he had no doubt the other members present too, had obtained great value from the detailed nature of Mr. Pedder's lecture, and the honesty with which he had stated the accounting and machine problems encountered.

* * *

### *Programming Study Group*

The programming Study Group has been formed to study autocoding techniques, with particular reference to their use in data processing. These meetings have so far consisted of short talks, followed by a discussion period.

Mr. R. A. Brooker, (*Computing Machine Laboratory, Manchester University*) opened the series with a description of the Manchester University Autocoder, and Mr. J. W. Wright (*Department of Industrial Administration, Manchester University*) followed by explaining the use of the IBM 704 Data Packaging System. Mr. C. Robinson (*English Electric Co., Ltd.*) spoke of systems on DEUCE at Stafford, whilst Mr. Gelly (*I.B.M.*) explained the use of SOAP on the IBM 650. Two further meetings have been arranged, one with a representative from Metropolitan-Vickers Electrical Co., Ltd., and one from Remington Rand, Ltd.

These studies have promoted great interest in the subject as

shown by the lively discussions which took place after the talks. It is hoped that the Groups will come to some form of conclusion.

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### *Beginners' Study Group*

Three meetings have been held so far this session; fog caused the cancellation of a fourth. The members of the Group decided that, to start each evening, one of the more experienced members should give a short talk on a previously agreed subject, the remaining time being devoted to group discussion. All subjects were to be related to Data Processing.

At the first meeting a member gave a detailed talk on the components of a computer and the peripheral equipment available; the group were also given details of relative speeds and costs of Input-Output media. The second evening a member gave a talk on a proposed Data Processing System on which he was working as a member of a team, the difficulties encountered and the reasons why certain courses of action had been taken or were to be taken. During the third evening two members each recounted the methods used by their separate organisations in making a feasibility survey and a systems study.

The subsequent discussions are proving of great assistance to members in giving them ideas on how to proceed within their own fields.

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# CONFERENCE

## The Strasburg Conference on Analogue Computation, September 1958

A strong impression left by the second conference of the International Association for Analogue Computation is a sensation of regret that it was not possible to hear all the papers in which one was interested. In order to allow time for the listed 91 papers, with ample discussion time and a whole day motor-coach trip, three simultaneous sessions were arranged for each of the four half-days devoted to the presentation of papers. The allocation of papers to sessions seemed rather arbitrary, and it was not possible to adhere to the announced running order in each session, so that movement from one session to another was not very rewarding. The difficulties were increased by the last minute appearance of the programme and summaries of papers, by the absence of the promised simultaneous translation, and by the lack in one lecture room of facilities for showing slides.

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In the opinion of the writer, many of the papers were pot-boilers, of both commercial and personal varieties, and the Reading Committee should have rejected about half of them. This would have allowed a rearrangement of the programme to avoid simultaneous sessions.

These criticisms aside, a gathering of 300-odd workers in the analogue field, comprising 22 different nationalities, was bound to be interesting and stimulating. A number of papers on the Incremental Computer (Digital Differential Analyser) led to a discussion which had to be continued on two further afternoons, the main contributions being J. A. F. Brodin (*France*) and Max Palvesky (*U.S.A.*), sustaining respectively the theoretical and practical approaches. Several other papers compared analogue and digital methods, and it was clear that numerical analysts are beginning to scrutinise analogue methods closely, to the benefit of both.

A large number of papers were concerned with two or more independent variables, and it was stated that boundary conditions are more easily imposed on an analogue computer. J. R. Levitt (*U.S.A.*) described an analogue embodiment of the Lagrange interpolation formula, with an extension to functions of three variables. A. Svoboda (*now at the Institute of Computing Machines in Prague*) spoke on his own subject, linkage-type function generators, for one, two and three independent variables. M. Casse (*France*) described a mechanical computer, consisting of weights, springs, and wires, for solving problems of minimum cost distribution of products. R. R. Favreau (*U.S.A.*) explained a process for the "statistical optimisation" of a system which makes no demands on the nature of the system to ensure the stability of the process.

The maximum use of passive elements in a simulator was advocated by G. D. McCann (*U.S.A.*), and V. B. Oushakov (*U.S.S.R.*) mentioned an entirely transistorised computing amplifier. Among the contributions on components was a description of a multiplier by P. J. Rademakers and C. M. Verhager (*Netherlands*) using two photosensitive resistors as a potentiometer, adjusted by the light from two neon tubes working on a variable mark/space ratio. The film shown by A. Chiesa and G. Tangorra (*Italy*) was very well received. It showed, on an oscillograph presentation of computer outputs, the motions of the wheels and body of a rectangular motor car, in response to road bumps.

There were several social functions, and here R. Tomovic must be mentioned. The first volunteer at the closing banquet, he rendered a Yugoslavian song in a fine tenor voice. The more formal, technical contributions to the success of the conference are to be published by the Association, and this will be awaited impatiently.

G. C. Toothill

# AMERICA BUYS BRITISH

America has ordered four of the new NATIONAL-ELLIOTT 802 electronic computers. The orders include special input and output devices.

This announcement means that for the first time a British concern has broken into the powerful American computer market. Inquiries have also been received from a number of continental countries as well as from firms in this country; negotiations are in progress for the sale of at least two machines to the Continent.

The computers going to America will be used in industrial data processing systems, for oil refineries, major chemical plants, large power stations and steel mills.

The NATIONAL-ELLIOTT 802 is a general purpose machine, the chief characteristics of which are the extensive use of junction transistors and ferrite cores resulting in small physical size, low cost and high reliability.

(*Continued overleaf*)

*The National-Elliott 802 General Purpose Digital Electronic Computer*

## *Brief Specification*

| | |
|---|---|
| *Input* | By 5-hole punched paper tape at speeds up to 170 characters per second. |
| *Output* | By 5-hole punched paper tape, punched at 25 characters per second and subsequently interpreted at 10 characters per second. |
| *Optional Input and Output* | The order code allows a choice to be made between the various input and output equipment attached to the 802. |
| *Storage* | Magnetic core store, capacity 1,020 words of 33 binary digits each, plus 4 words of fixed orders. Access time zero. |
| *Arithmetic Unit* | Digit rate: 166,500 per second.<br>Notation and arithmetic mode: binary, serial.<br>Word length: 33 binary digits. |
| *Order Code* | Single address, two orders per word. |
| *Order Structure* | $Function_1$ $Address_1$ B $Function_2$ $Address_2$<br>digits 33—28 27—18 17 16—11 10—1<br>m.s. end l.s. end |
| *B Modification* | Any location in the store may be used as a B-modifier. When the B digit is present the contents of $Address_1$ are added to the $Order_2$ before it is obeyed. This operation takes no extra time. |
| *Operating Speeds* | Addition, subtraction and 46 other orders: 0·612 milliseconds.<br>Multiplication and division: 21·4 milliseconds. |
| *Negative Number Representation* | Complement with respect to two. |
| *Accumulator* | 33 binary digits. |
| *Auxiliary Register* | 32 binary digits, used as less significant half of double-length accumulator. |
| *Power Requirements* | Approximately 2 kVA. |
| *Layout* | The 802 is "L" shaped. One arm contains the store and arithmetic unit and the other arm comprises the control console and the input/output circuitry. The power supplies are housed in a separate free-standing cabinet. |
| *Dimensions* | Store and arithmetic unit: 7 ft. 4 in. × 2 ft. 6 in. (223 × 76·2 cm).<br>Console and input/output: 5 ft. 2 in. × 2 ft. 9 in. (158·5 × 83·8 cm).<br>Power Unit: 2 ft. 9 in. × 2 ft. 6 in. (83·8 × 76·2 cm).<br>All units are 2 ft. 8 in. (81·3 cm) high. |

## Programming

The order code was evolved as a result of long experience; careful logical design has ensured that there are no exceptions to the rules.

Orders are of the single address type, and there are two orders, each of 16 binary digits, per word of 33 binary digits.

The extra digit is used for automatic modification of orders (B-modification). By means of this digit any location in the store may be used as a B-line. A B-lined order takes no longer to obey than the same order without a B-line. In previous computers facilities for doing this automatically have been limited to a few registers, often less than eight. The 1024 B-registers in the 802 make it possible to simplify the programming of extremely complex problems.

By using simplified operating methods it is claimed that the 802 will not require specialised programming staff. It is said that the ultimate user will be able to write programs for the 802 himself after only a short period of initial instruction.

## Reliability

The store of the 802 consists of a matrix of magnetic cores. Cores are also used, in conjunction with transistors, to form the basic logical elements, and by eliminating almost all valves long periods of trouble-free operation are possible.

These units are themselves mounted on printed-circuit plug-in boards which make for reliability and easy maintenance.

## Input and Output

The basic 802 allows for punched paper tape input and output. Provision has been made in the design, however, to allow punched card input, manual keyboard input, analogue and digital recording mechanisms, and other devices, to be attached to the machine simultaneously.

## Applications

Apart from applications as a general purpose computer in all branches of industry and commerce, the 802 is being used to control industrial processes, ranging from data recording and logging to on-line analysis and control of factory plant.

## Speed

The 802 is a stored program machine which operates from a single level very fast access store. This means that all the instructions and data are available immediately they are required, wherever they are situated in the store. Minimum access coding is not required, and the computer is always operating at full speed.

* * *

Members of the Society will have an opportunity to learn more of this machine on 6 May, when Mr. R. L. Cook will give a talk on the use of a NATIONAL-ELLIOTT 802 for process control (see Members' Diary on page v); he will also describe its use as an on-line device, with particular reference to the time-sharing techniques employed.

# BOOK REVIEWS

## *The Preparation of Programs for an Electronic Digital Computer, 2nd Ed.*

By M. V. Wilkes, D. J. Wheeler and S. Gill, 1957; 238 pages. (Reading, Mass., *Addison-Wesley Press Inc.;* London, *Academic Books Ltd.*, 60s. 0d.)

There is a noticeable lack of advanced or even intermediate level books on programming. The introductory and elementary levels are by now moderately well catered for by the handbooks for various machines and a few general books such as McCracken (though there are still a number of unresolved problems about the best "computer language" to use in a general introduction). But when it comes to the sort of programming problems (as opposed to the problems of numerical analysis) which crop up after the elements have been mastered, there appears to be no help available from the literature at all. This is not, as it sometimes appears to the tyro, because there are no problems; nor is it because the problems are so difficult that they have no solution. The difficulty, I think, is caused by the problem of distinguishing clearly between the features of a program which are basic, and those which are merely adventitious or forced on the programmer by the peculiarities of his machine.

The second edition of Wilkes, Wheeler and Gill shows up this difficulty rather clearly. It has been very extensively revised since the first edition and is now printed to look like a book; indeed apart from a rather deplorable weakness in the binding material, it is an extremely well-produced book. It is divided into three parts. The first starts with an excellent introduction to programming; unlike most introductions of this sort it appears to be written for a moderately intelligent reader. The machine used is EDSAC 1 which is by now extinct but, as the authors point out in the preface, the use of a real rather than a hypothetical machine means that the irritating inconsistencies and complications which still appear in the order codes of most machines are not glossed over. Part 1 also contains a short chapter on programming for other machines and another on automatic programming. These contain a great deal of interesting material, but they are much too short. Chapter 3 (Programming for Other Machines) will be particularly disappointing to readers in this country as it makes no serious attempt to discuss the problems introduced by having a two-level store.

Parts 2 and 3 contain the specifications of a selection of the library subroutines available for EDSAC 1, and the detailed programs of some of them. This is where the difficulties of using a real computer become important. The question which immediately springs to mind is: What is the purpose of publishing the detailed library programs for an extinct computer? Apart from their historic interest, they might well be of very considerable value to someone who was planning a subroutine library for another machine. The specification of library subroutines is a difficult but vitally important task and invariably involves all sorts of compromises. The detailed specifications of a library which has been found by experience to be useful can be of the greatest possible assistance in this, but only provided one can distinguish the wood from the trees and discount those undesirable features which have been forced on the programmers by the structure of their machine. The actual programs themselves are probably

less immediately useful, but they often show the mathematical methods used much more clearly than any specification, and they can act as object-lessons for style in program writing. But once more their value depends on being able to sort out the ideas which are applicable to another machine.

Unfortunately no real attempt is made in the book to outline the principles on which library subroutines should be specified or written. This omission is made more serious by the fact that several important subroutines have, probably for historical reasons, specifications which are not wholly satisfactory. The design of basic library subroutines has much in common with that of the order code for a machine, for many of these subroutines can best be considered as extending the order code of the machine. This is particularly true of division and square root routines. Most programmers would feel justified in complaining if a machine designed today were to have a division order which sometimes did, and sometimes did not, set the overflow indicator irrespective of whether the result of the division were in range or not. Yet this is precisely what the division subroutine D11 does, and there is no indication anywhere that this sort of treatment of the overflow indicator is a disadvantage. In fact D11 is described in Chapter 5 as the most frequently used division subroutine (for the very good reason that it divides a double length number by a single length one). This criticism is not directed at the author of D11; in all probability the routine was written before the overflow indicator was added to EDSAC 1, and by that time was too entrenched to be altered or withdrawn. I am not even suggesting that the routine should have been omitted. I am suggesting that if a routine of this sort were written today its specification would be different and that it is unfortunate that practically no indication of this historical influence appears in the book.

The detailed programs in Part 3 show the same sort of confusion between the essential and the unimportant. There is a vast amount of ingenuity locked up in this collection of subroutines ranging from the elegance of M30 to the rather irritating cleverness of R30. The first of these introduces the Gillies–Miller method of sideways addition which is applicable to almost any machine; the second uses the unusual control combination G$\pi$K for no ascertainable purpose. (After puzzling over this particular detail for a long time and consulting several other programmers I came to the conclusion that it was a display of ingenuity for its own sake—an activity with which I have considerable sympathy; but one which is out of place here.)

The accuracy of a book of this sort is of the very greatest importance, particularly for the reader who is new to EDSAC 1. I detected only one misprint (the top left arrow in the diagram on p. 35) though there were several incorrect or confusing cross-references (pp. x, 1. 15; 29, 1. 4; 219, 1. 15). A slightly more serious difficulty of detail is the fact that the Initial Input Routine given in Appendix 3 uses an order not given in the list of orders (I 40D) which has a good second function (to clear location 41) which is not immediately obvious.

On the whole, however, I think the accuracy of this book is very high, and in spite of its disadvantages it remains the only book which contains a large collection of detailed computer programs. I should like to see more.

C. STRACHEY

## *Theory and design of Magnetic Amplifiers*

By E. H. Frost-Smith, 1958. (London, *Chapman & Hall Ltd.*, 75s. 0d.)

Dr. Frost-Smith's book is a welcome addition to the literature of magnetic amplifiers. The publisher's statement that the author can impart his knowledge clearly is fully justified; the reader has the impression that he is being held by an expert hand and led gently but firmly through the intricacies of magnetic amplifiers in their various forms. The use of numerical examples is admirable and helps to bring the fundamental mathematics down to a practical level.

Other features of the book are the tables at the end of each chapter summarising the main formulae and the banishing of detailed mathematical treatments to appendices. The former is invaluable but it is suggested that the reference numbers used in the text be included in the table so that the derivation of a particular expression, or perhaps the limiting conditions which apply to it, can be found without difficulty. As regards the appendices, the basic idea is good but the mathematical text is too far removed from the corresponding diagrams which are, of course, in the main body of the book. It is tedious to have to turn back so many pages to find the diagram quite apart from, in some cases, the 90° rotation required as well. Your reviewer would prefer to see the mathematics in the main text either in different type or with an indication that it can be excluded from reading if necessary.

The introduction of servo systems to the chapter on design is undesirable. It is an unnecessary complication to those not familiar with such systems, and for such readers the short chapter on closed-loop systems would not be sufficiently detailed. It would have been better to divorce the subject entirely from closed-loop systems.

However, the criticisms above do not seriously affect the quality of this book. It can be thoroughly recommended to designers, to engineers who wish to understand the operation of magnetic amplifiers and (so long as it is considered as being complementary to lectures) to students of postgraduate level.

G. ASHDOWN

## *Selected Abstracts from the Journal of the Brit. I.R.E. 1946 to 1958*

72 pages. (London, *The British Institution of Radio Engineers*, 3s. 6d.)

This booklet, which may be useful to those setting up new libraries, contains about 500 abstracts including nearly 30 on computers. These are mostly of concern to computer designers; the most useful papers referred to are a few recent ones describing new equipment.

S. GILL

# NEWS FROM MANUFACTURERS

## *New Univac Computer*

*Remington Rand Ltd.* announce that they are marketing a new computer in the U.K. This is a medium-priced machine named the UNIVAC CALCULATING TABULATOR (UCT), combining punched card input and output, and on-line high-speed printing. It is capable of 11,000 additions and 4,000 multiplications per second, and has a drum capacity of 5,000 words—1,000 of which have a fast access of ·85 milliseconds and 4,000 of which have a slower access of 3·4 milliseconds. The on-line printer operates at 600 lines per minute—the same speed as the off-line printer for UNIVAC I and II. The computer is so designed the magnetic tape may eventually be used as well as punched cards for input and output.

Several UCT machines are on order in Europe and one has been installed by the Dresdner Bank in Hamburg. It is intended to use the computer to calculate and print daily statements on current and other accounts of the bank's Hamburg branches. Delivery in the U.K. is announced as 12 months, and the early installations will use REMINGTON 90-column cards with 80-column input provided later.

## *Fast and Compact Storage*

Scientists at *The National Cash Register Company's* research laboratories in the U.S.A. have developed a tiny magnetic device—a pin-sized glass rod with a magnetic coating—which will serve both as a switching and an information storage element.

The rod is said to be capable of recording and releasing information at the high speed of between 25 and 250 *millionths* of a second.

These tiny devices can be linked together electrically within a very small space. For example, a rod memory system the size of a small packet of cigarettes could store 8,000 "bits" of information.

Each glass rod is approximately 15 thousandths of an inch in diameter and its magnetic coating is applied by a special electrochemical process developed by N.C.R. Small windings of wire around the coated rod convey the information to be stored or read out and only 20 thousandths of a watt is required to store a "bit" of information on the rod—a small fraction of the power required by other switching and memory units.

## *Fanfolds' Continuous Stationery for Computer Use*

*Fanfold Ltd.* have introduced sprocket-punched carbon interleaved stationery for use with computers, tabulators, teleprinters and typewriters equipped with pin-wheel platens. An advantage is the facility for documents which travel together, to remain joined complete with carbon paper for any subsequent writing, yet for the forms to be detached easily. This feature is useful when it is desired to print and send out two documents joined together for the subsequent return of one of them.

Another new *Fanfold* product is the hectographic attachment to the CARBALINE feed to increase efficiency and economy in the production of spirit duplicating masters on tabulators and printers. The feeds are so arranged that the hectographic carbon will only feed when the tabulator prints, and after the master has been prepared no further handling operations, such as deleaving, are required.

## *I.C.I. Plastics Division*

*Imperial Chemical Industries Ltd.* have ordered an EMIDEC 1100 electronic computer to handle a wide variety of clerical work in the Plastics Division at Welwyn Garden City. The EMIDEC 1100 will handle stock control, distribution procedure and product costing. As these data processing operations are interrelated it is planned to use the computer for integrated work rather than as an isolated unit handling a series of specific tasks. The machine is due for delivery in March 1960.

## *Tape Deck*

*E.M.I. Electronics* have developed a new fast magnetic tape deck which is said to combine high tape speed and fast stop/start and reverse operation. The tape deck uses recording heads out of contact with the tape, serving up to 24 tracks on one-inch tape. Tape running speed is 200 inches per second and the overall start and stop times are under 5 milliseconds, with the actual tape acceleration and deceleration times of the order of 1 to 2 milliseconds.

## *Computers for U.K.A.E.A.*

A *Ferranti* MERCURY computer has been installed at the *Atomic Energy Industrial Group* at Risley; this machine is now operational. In the spring of 1959 an *Electronic Associates* PACE computer will be installed. This machine is an extremely powerful analogue computer of 60 integrating amplifiers and 90 summing amplifiers.

The Risley Computing Section forms part of the Industrial Group's Research and Development Branch and is a section of the Central Technical Service. A team of mathematicians and programmers has been built up over the last two years and there are now twenty full-time programmers with experience covering the FERRANTI MK I, MK I*, MERCURY, the DEUCE and the IBM 704.

Extensive use is being made of the MERCURY and this machine will eventually run a 24-hour day; the section has immediate access to the IBM 704. In charge of the section is Dr. G. Black.

## *New Appointments*

*Ferranti Ltd.* announce that Mr. P. D. Hall, B.Sc., M.I.E.E., has been appointed Manager of the Computer Department following the resignation of Mr. B. W. Pollard. Mr. Hall, aged 39, joined *Ferranti* in 1951 as a senior electronics development engineer and was appointed manager of the Electronics Department in 1955. *Ferranti's* Computer Department includes the main manufacturing plant at West Gorton, Manchester, the Computer Centre in London, and research and development laboratories at Bracknell, Berks.

*I.B.M.* have formed a new British subsidiary company, *I.B.M. World Trade Laboratories (Great Britain) Limited.* Mr. W. S. Elliott, M.A., M.I.E.E., F.Inst.P., has been appointed Managing Director of the Laboratories which are situated near Winchester in Hampshire.

Mr. C. Kramskoy has been appointed Chief Engineer of the Commercial Division of *E.M.I. Electronics Ltd.* Mr. Kramskoy was previously responsible for the development of the EMIDEC 2400 computer.